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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**GEOGRAPHY (Paper – I)**  
**Gg – 331 : Principles and Techniques of Watershed Management**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- N.B. :** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*  
3) *Diagrams and Maps must be drawn wherever necessary.*  
4) *Use of Maps Stencils is allowed.*

1. Answer the following questions in **one** or **two** sentences : **10**
- a) Define Watershed.
  - b) List any two objectives for Watershed Management.
  - c) What is a Drainage Basin ?
  - d) Define Hydrological Cycle.
  - e) Name the types of Watershed according to size.
  - f) What is Drainage Divide ?
  - g) Define Evapo-transpiration.
  - h) What is meant by USLE ?
  - i) What is Interception Storage ?
  - j) State the need for Land Capability Classification ?
2. Write short answers (**any two**) : **10**
- a) Describe the methods of Delineating a Watershed.
  - b) Explain the need for Watershed Management.
  - c) Describe the Hydrological Characteristics of soil in a Watershed.

P.T.O.



3. Write short notes (**any two**) : **10**

a) Role of Ground Water Flow in Watershed.

b) Types of Precipitation.

c) Linear Aspects of Watershed.

4. Describe the different problems faced while planning for Watershed. **10**

OR

Describe the methods of Land Capability Classification.

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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**GEOLOGY (Paper – I)**  
**GL – 331 : Minerology**  
**(2008 Pattern) (New Course)**

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) **All** questions are **compulsory**.  
2) **All** questions carry **equal** marks.  
3) **Black** figures to the **right** indicate **full** marks.  
4) **Neat** diagrams must be drawn **wherever** necessary.

1. Answer the following questions in **2/3** lines. **10**
  - a) What is the composition of dolomite ?
  - b) What is biaxial mineral ?
  - c) What is inclined illumination ?
  - d) What is grossular ? Give its crystal system.
  - e) Define pleochroism.
  - f) What is limonite ?
  - g) What is quartz wedge ?
  - h) What is indicatrix ?
  - i) What are fibrous zeszites ?
  - j) Define optic axis.
2. Write notes on (**any two**) : **10**
  - a) Mica plate.
  - b) Structure and paragenesis of amphibole.
  - c) Mineralogy and properties of fire clay.
3. Explain the following (**any two**) : **10**
  - a) Paragenesis and uses of calcite.
  - b) Composition and physical properties of apatite.
  - c) Mineralogy and properties of gypsum.
4. Give silicate structure, chemical composition, physical and optical properties, paragenesis and alteration products of FELSPAR mineral group or MICA mineral group. **10**



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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**STATISTICS (Principal) (Paper – I)**  
**ST – 331 : Distribution Theory – I**  
**(2008 Pattern) (New Course)**

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) **All** questions are **compulsory**.  
2) Figures to the **right** indicate **full** marks.  
3) **Use** of scientific calculator and statistical tables is **allowed**.  
4) Symbols and abbreviations have their **usual** meaning.

1. Attempt **each** of the following :

a) Choose the correct alternative in each of the following : **(1 each)**

i) If  $X \sim \beta_2(2,3)$  then  $E\left(\frac{1}{X}\right)$  is

- A) 3                      B)  $\frac{2}{5}$                       C) 1                      D)  $\frac{3}{5}$

ii) If  $X \sim W(a, \beta)$  the distribution of  $Y = \left(\frac{X}{\alpha}\right)^\beta$  is

- A) Normal  $(a, \beta)$                       B) Standard exponential  
C) Standard normal                      D) Uniform  $(a, \beta)$

iii) If  $(X_1, X_2, X_3) \sim MD(8, 0.2, 0.1, 0.7)$  then the mean of  $X_2$  is

- A) 1                      B) 1.6                      C) 0.8                      D) 5.6

iv) A random variable X has mean 3 and variance 4. The least value of

$P[|X-3| < 4]$  is

- A) 1                      B)  $\frac{1}{2}$                       C)  $\frac{1}{4}$                       D)  $\frac{3}{4}$



b) State whether **each** of the following statement is **true** or **false** : **(1 each)**

i) If  $(X_1, X_2, X_3) \sim \text{MD}(30, 0.2, 0.3, 0.5)$  then the distribution of  $U = X_1 + X_2$  is binomial.

ii) If  $X \sim \beta_1(5, 10)$  then  $\frac{1-X}{X}$  has  $\beta_2(5, 10)$  distribution.

c) Define convergence in distribution. **1**

d) State the central limit theorem (CLT) for independent and identically distributed random variables. **1**

e) State weak law of large numbers (WLLN). **1**

f) State relationship between Weibull distribution and gamma distribution. **1**

2. Attempt **any two** of the following : **(5 each)**

a) Let  $X \sim W(a, \beta)$ . Obtain the quartile deviation of distribution of  $X$ .

b) A die is tossed 12 times. The probability that the number  $i$  appears uppermost is proportional to  $i$ . Find the probability that each number appear uppermost twice.

c) State and prove Chebychey's inequality for a continuous r.v.  $X$  with  $E(X) = \mu$  and  $\text{Var}(X) = \sigma^2$ .

3. Attempt **any two** of the following :

a) A continuous r.v.  $X$  has probability density function given by

$$f(x, \theta) = \begin{cases} \frac{1}{\theta} e^{-x/\theta} ; & x > 0, \theta > 0 \\ = 0 & , \text{ otherwise} \end{cases}$$

Find the distribution of  $i^{\text{th}}$  order statistic of a random sample of size  $n$ , drawn from the above distribution. **5**



b) i) A r.v.  $X$  has mean 0 and variance  $\frac{1}{4}$ . Find  $C$  such that  $P[|X| > C] \leq \frac{1}{4}$ . **2**

ii) Let  $\bar{X}$  be the mean of a r.s. of size 100 drawn from chi square distribution with 50 d.f. Using CLT find  $P[48.04 < \bar{X} < 51.9]$ . **3**

c) Let  $X \sim \beta_1(m, n)$ . Derive the expression for  $r^{\text{th}}$  raw moment. Hence or otherwise find mean and variance. **5**

4. Attempt **any one** of the following :

a) i) Obtain joint probability density function of  $i^{\text{th}}$  and  $j^{\text{th}}$  order statistics for a random sample of size  $n$  from a continuous distribution. **7**

ii) It is known that the duration  $X$  in days of an epidemic of a certain disease has a Weibull distribution with parameters  $a = 10$  and  $\beta = 2$ . What is the probability that the epidemic of disease will last for less than 6 days ? Also find the expected length in days of an epidemic of the disease. **3**

b) i) Let  $(X_1, X_2, \dots, X_k) \sim \text{MD}(n; p_1, p_2, \dots, p_k)$ . State the variance-covariance matrix and obtain its rank. **5**

ii) If  $X$  and  $Y$  are i.i.d.  $G(1, 1)$  variates, find  $P\left[\frac{X}{Y} \leq 1\right]$  and  $P\left[\frac{X}{X+Y} \leq \frac{1}{2}\right]$ . **5**

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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**COMPUTER SCIENCE (Paper – V)**  
**CS – 335 : Programming in Java – I**  
**(2008 Pattern) (New Syllabus)**

Time : 2 Hours

Max. Marks : 40

**Instructions :** 1) Figures to the **right** indicate **full** marks.  
2) **All** questions are **compulsory**.  
3) Assume **no** syntax errors.

1. Attempt **all** of the following :

**(1×10=10)**

- a) What is sub-classing ?
- b) State the use of javadoc.tool.
- c) Describe any 2 features of the Java Programming Language.
- d) State the use of wrapper classes.
- e) Why is the finalize( ) method present in all Java classes ?
- f) What are the parameters to the drawOval( ) method ?
- g) What are checked exceptions ?
- h) Justify True / False :  
Java is not fully object-oriented.
- i) What method is used to compare values of 2 string objects ?
- j) What are packages ?

P.T.O.



2. Attempt **any two** of the following : **(2×5=10)**

- a) Define an interface ChkEmailId that defines a method Valid Email (String S) that returns a boolean value. Write a Java program that implements this interface. Your program must accept the mail-id from the command line. If the mail-id contains characters other than A to Z or a – z, @, underscore or ‘-’ & ‘.’ display an error message.
- b) Differentiate overloading and over riding with the help of examples.
- c) Write a Java program that uses the BufferedReader class to accept a string from the user. Your program should display the number of words in the string. It should also scramble the words in the string to create a new string and display it. For eg. If input string is :

“I like to program”

output should be

Count of words = 4

Scrambled string is ;

Program to I like

3. Attempt **any two** of the following : **(2×5=10)**

- a) Write a Java Applet that accepts two numbers in a text box. When user clicks calculate, the applet displays the GCD of the 2 numbers and the mean of all the numbers that lie between the two ?
- b) What is an assertion ? State the use of assertions and also state any 3 assertion rules.
- c) Write a program that reads a file containing name of persons along with their contact phone numbers. Display the contents of the file. Allow the user to jump to any position in the file and print contents at that position. Use Random Access File.





4. Attempt **any one** of the following (**A** or **B**) : (1×10=10)

A) 1) Write a short note on the MVC architecture. Why are swing components light-weight ? 5

2) Write a program that accepts a float value. It should throw an Exception “Temperature below normal” when the value is less than 94.00. An Exception “Normal Temperature” when the value is between 95.00 and 100.00. An Exception “High temperature” when the value is greater than 100.00. 3

3) Predict the output 2

i) Public Class Test

```
{
    Public static void main (string [ ] args)
    {
        int j = 0 ;
        int i = ++ j + j * 5 ;
        System . out . print/n (“i=” + i) ;
    }
}
```

ii) Class MyDate

```
{
    public static void main (string [ ] args)
    {
        java.util.Date
            x = new java.util.Date ( ) ;
        object y = x . clone ( ) ;
        system.out.print/n (y.get class ( ) ) ;
    }
}
```



- B) i) State the advantages that Java’s layout managers provide over traditional windowing systems. Explain any two layouts supported in swing. 5
- ii) Write a java program to accept a number and print all prime numbers upto that number. 3
- iii) Predict the output 2

i) Public Class Test

```
{  
    public static void main (string [ ] args)  
    {  
        double [ ] x = new double [ ] {1, 2, 3};  
        system.out.print/n (x [1] ) ;  
    }  
}
```

ii) Consider the following method defined in a class

```
static void nPrint (string msg, int n)  
{  
    while ( n > 0) {  
        system.out.print/n (msg) ;  
        n -- ;  
    }  
}
```

State the output when the above method is invoked from main ( ) using an object of the class as :

t.n Print (“A message”, 2) ;

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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**Paper – I : MATHEMATICS**  
**MT 341 : Metric Spaces**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

**Instructions :** i) **All questions are compulsory.**  
ii) **Figures to the right indicate full marks.**

1. Attempt **any five** of the following : **10**

- i) Let  $d$  and  $\delta$  be the absolute value metric and the discrete metric respectively on the set of real numbers  $\mathbb{R}$ . Find  $B_d(0, 1)$ ,  $B_\delta(0, 1)$ .
- ii) Let  $a \in \mathbb{Z}$ . Is  $\{a\}$  open in  $\mathbb{Z}$  with the absolute value metric? Justify.
- iii) Let  $A, B$  be subsets of a metric space  $X$ .  
If  $A \subseteq B$  show that  $\overline{A} \subseteq \overline{B}$ .
- iv) Find all the cluster points of the set  $\{(x, y) \in \mathbb{R}^2 \mid x > 0, y > 0\}$  in  $\mathbb{R}^2$ .
- v) Is a circle homeomorphic to a parabola in  $\mathbb{R}^2$ ? Justify.
- vi) Show that, if  $A$  is a compact subset of a discrete metric space  $(X, d)$ , then  $A$  is finite.
- vii) Is the set  $\{x \in \mathbb{R} \mid |x| > 0\}$  connected in  $\mathbb{R}$ ? Justify.

2. Attempt **any two** of the following : **10**

- i) Let  $V_i, 1 \leq i \leq n$  be a finite collection of open sets in a metric space  $(X, d)$ .  
Show that  $\bigcap_{i=1}^n V_i$  is open in  $X$ . Also, show by means of an example that the intersection of an arbitrary family of open sets need not be open.
- ii) Let  $(X_1, d_1)$  and  $(Y_1, d_2)$  be metric spaces. Show that  $d(x_1, y_1), (x_2, y_2) = \max\{d_1(x_1, x_2), d_2(y_1, y_2)\}$  defines a metric on the product set  $X \times Y$ .
- iii) Show that any closed ball  $B[x, r]$  in a metric space  $(X, d)$  is closed.

P.T.O.



3. Attempt **any two** of the following : **10**

- i) Let  $(X, d)$  be a metric space. Show that, a Cauchy sequence in  $X$  is convergent if and only if it has a convergent subsequence.
- ii) Let  $(X, d)$  be a metric space. Show that the function  $f_x$  defined by  $f_x(y) = d(x, y)$  is continuous on  $X$  for fixed  $x \in X$ .
- iii) Prove that, a metric space  $X$  is connected if and only if every continuous function  $f : X \rightarrow \{\pm 1\}$  is a constant function.

4. Attempt **any one** of the following : **(10)**

- i) a) Show that continuous image of a compact metric space is compact.
- b) Show that every closed subset of a complete metric space is complete.

ii) a) Show that if a metric space  $(X, d)$  is compact then it is complete and totally bounded. **6**

b) Show that a rectangle of the form  $(a, b) \times (c, d)$  is open in  $\mathbb{R}^2$  ? **4**

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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**GEOLOGY (Paper – II)**  
**GL-342 : Environmental Geology**  
**(New) (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) **All** questions are **compulsory**.  
2) **All** questions carry **equal** marks.  
3) Figures to the **right** indicate **full** marks.  
4) Draw **neat** labelled diagrams/Figures **wherever** necessary.

1. Define/Answer the following in **2/3** lines. **10**
- a) Soil conservation.
  - b) Biogeochemical cycle.
  - c) Salinity of soils.
  - d) Disaster profile of India.
  - e) Tsunami.
  - f) Importance of solar energy.
  - g) Desertification.
  - h) Mining restoration.
  - i) Ozone layer depletion.
  - j) Land slide.

P.T.O.



2. Answer the following (**any two**) : **10**
- a) Define Volcano. Describe the types of volcanic hazards.
  - b) Explain Bhopal gas disaster.
  - c) Phosphorus cycle.
3. Write notes on (**any two**) : **10**
- a) Define erosion. Enumerate the causes of erosion.
  - b) Crises faced by mankind with regards to the conventional sources of energy.
  - c) Biological environment.
4. Define earthquakes. Describe the terms associated with earthquakes. Explain the instrumental and natural precursors to predict earthquakes. **10**

OR

4. Define flood. Describe the causes of flood. Add a note on the flood hazard in India and its mitigation measures. **10**



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T.Y. B.Sc. (Semester – IV) Examination, 2012  
STATISTICS (Principal ) (Paper– IV)  
ST-344 : Sampling Methods  
(2008 Pattern) (New Course)

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) **All** questions are **compulsory**.  
2) Figures to the **right** indicate **full** marks.  
3) **Use** of scientific calculator and statistical tables is **allowed**.  
4) Symbols and abbreviations have their **usual** meanings.

1. Attempt **each** of the following :

a) Choose the correct alternative in **each** of the following : **(1each)**

i) For a population with linear trend var ( $\bar{y}_{sy}$ ) is

A)  $\frac{b^2}{12} (k - 1) (k + 1)$     B)  $\frac{b^2}{12} (k - 1) (N + 1)$

C)  $\frac{b^2}{12} (N + 1) (k + 1)$     D)  $\frac{b^2}{12n} (k - 1) (k + 1)$

ii) In stratified random sampling with k strata, the size of subsample ( $n_i$ ) from  $i^{\text{th}}$  stratum using Neyman's allocation is

A)  $n_i = n W_i$     B)  $n_i = n W_i S_i$

C)  $n_i = n \frac{W_i S_i}{\sum W_i S_i}$     D)  $n_i = \frac{n W_i}{S_i}$

iii) Var ( $\bar{y}$ )<sub>SRSWOR</sub> is

A)  $\frac{N-1}{N} S^2$     B)  $\frac{N-n}{Nn} S^2$

C)  $\frac{S^2}{N}$     D)  $\frac{S^2}{n}$

P.T.O.



iv) The ratio estimator of population mean ( $\bar{y}_N$ ) is

A)  $\frac{\bar{x}}{\bar{y}} \bar{x}$

B)  $\frac{\bar{y}}{\bar{x}} \bar{x}$

C)  $\frac{\bar{x} \bar{y}}{\bar{X}}$

D)  $\frac{\bar{X}}{\bar{x} \bar{y}}$

b) State whether **each** of the following statements is **true** or **false** :

i) Probability that the unit is selected at 1<sup>st</sup> draw is same for SRSWOR and SRSWR.

ii) Regression estimator is biased estimators but bias  $\rightarrow 0$  as sample size  $n \rightarrow \infty$ . (1 each)

c) Define the following terms :

i) Sampling unit

ii) Sampling frame. (1 each)

d) i) State an unbiased estimator of population total in stratified random sampling.

ii) State any two demerits of systematic sampling. (1 each)

2. Attempt **any two** of the following :

a) In case of SRSWR derive an expression for standard error of an unbiased estimator of population mean.

b) State the requirements of a good questionnaire.

c) With usual notations ignoring f. p. c. prove that  $V(\bar{y}_{st})_{P.A.} \leq V(\bar{y})_{SRSWOR}$ .

(5 each)





3. Attempt **any two** of the following :

- a) In case of stratified random sampling cost function is  $C = C_0 + \sum c_i n_i$ . Determine the values of  $n_i$ 's so that variance of an unbiased estimator of population mean is minimum for fixed cost C.
- b) Explain the ratio method of estimation of population mean. Discuss relative efficiency of this method over SRSWOR,
- c) What are Non-sampling errors ? Describe in brief different sources of these errors. **(5 each)**

4. Attempt **any one** of the following :

- a) i) For a population with linear trend prove that  $\text{var}(\bar{y}_{st}) : \text{var}(\bar{y}_{sy}) : \text{var}(\bar{y})_{\text{SRSWOR}}$  is  $1 : n : n^2$  if population size (N) is large.
- ii) In a population of 1000 units, population variance is 100. What should be the size of the sample selected by SRSWOR from this population so that 95% of the sample means may differ from population mean by not more than 0.5 ? **(5+5)**
- b) i) Explain the procedure of systematic sampling. Obtain an unbiased estimator of population mean under systematic sampling. Compare its efficiency with that of SRSWOR.
- ii) Define regression estimator of population mean. State any two properties of this estimator. State the expression for variance of this estimator. **(5+5)**





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T.Y. B.Sc. (Semester – III) Examination, 2012

MATHEMATICS (Paper – I)

MT-331 : Set Theory and Logic

(2008 Pattern) (New Course)

Time : 2 Hours

Max. Marks : 40

**N.B. :** 1) *All questions are compulsory.*

2) *Figures to the right indicate full marks.*

1. Attempt **any five** of the following :

10

- i) Give Cantor's definition of a set.
- ii) Let  $\rho$  be a relation in  $\mathbb{R}$  with  $0 \leq x \leq 2$  as defining property and  $\sigma$  be a relation in  $\mathbb{R}$  with  $0 \leq y \leq 1$  as defining property. Draw the graph of the relations  $\rho \cap \sigma$  and  $\rho \cup \sigma$ .
- iii) Show that the set of integers  $\mathbb{Z}$  is countable.
- iv) Construct a truth table for the compound proposition  $(p \vee q) \rightarrow (p \oplus q)$ .
- v) If  $(x) : "x \text{ is a comedian}"$ ,  $F(x) : "x \text{ is funny}"$ , and the domain consists of all people. Translate the following statements into English.  
 $(\forall x) ((x) \rightarrow F(x)), (\exists x) ((x) \wedge F(x))$ .
- vi) Express the following statement using operators, predicates and quantifiers, where the domain consists of all integers-  
"The difference of two positive integers is not necessarily positive".
- vii) Show that the proposition  $P(0)$  is true where  $P(n)$  is "if  $n > 1$ , then  $n^2 > n$ " and the domain consists of all integers.

P.T.O.



2. Attempt **any two** of the following : 10
- i) Prove that the following statements about sets A and B are equivalent.
    - a)  $A \subseteq B$                       b)  $A \cap B = A$                       c)  $A \cup B = B$
  - ii) In the set  $\mathbb{Z}^+ \times \mathbb{Z}^+$  define  $\langle a, b \rangle \sim \langle c, d \rangle$  iff  $a + d = b + c$ . Show that  $\sim$  is an equivalence relation on this set. Find  $\sim$ -equivalence class of  $\langle 1, 2 \rangle$ .
  - iii) Show that  $\mathbb{N} \times \mathbb{N}$  is countable.
3. Attempt **any two** of the following : 10
- i) Show, without using truth tables that  $(p \wedge q) \rightarrow (p \vee q)$  is tautology.
  - ii) Show that the argument with premises  $(p \wedge t) \rightarrow (r \vee s), q \rightarrow (u \wedge t), u \rightarrow p$  and  $\sim S$  and conclusion  $q \rightarrow r$  is valid.
  - iii) Let  $L(x, y)$  be the statement “x loves y”, where the domain for both x and y consists of all people in the world. Use quantifiers to express the following statements :
    - a) Everybody loves somebody
    - b) There is somebody whom nobody loves
    - c) Everybody loves mother
    - d) Everybody loves himself or herself
    - e) There is someone whom everybody loves.
4. Attempt **any one** of the following : 10
- i) a) Define the terms – tautology, argument, direct proof, theorem, trivial proof.
  - b) Prove that if n is a finite cardinal then  $n < \overline{\mathbb{N}}$ .
  - ii) a) Give a proof by contraposition of the theorem “if n is an integer and  $3n + 2$  is odd, then n is odd”.
  - b) Show that  $\forall x P(x) \vee \forall x Q(x)$  and  $\forall x (P(x) \vee Q(x))$  are not logically equivalent.



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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**MATHEMATICS (Paper – II)**  
**MT-332 : Real Analysis**  
**(New Course) (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

**N.B. :** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*

1. Attempt **any five** of the following :

**10**

i) Find the limit superior and limit inferior of the sequence  $\left\{ \sin \frac{n\pi}{2} \right\}_{n=1}^{\infty}$ .

ii) Does the series  $1 - \frac{1}{2} + \frac{1}{3} - \frac{1}{4} + \frac{1}{5} - \frac{1}{6} + \dots$  converge? Justify.

iii) If  $\left\{ |S_n| \right\}_{n=1}^{\infty}$  converges to 0, then prove that  $\left\{ S_n \right\}_{n=1}^{\infty}$  also converges to 0.

iv) Give an example of a sequence  $\left\{ S_n \right\}_{n=1}^{\infty}$  which is not bounded but for which

$$\lim_{n \rightarrow \infty} \frac{S_n}{n} = 0.$$

v) Discuss the convergence of the series  $\sum_{n=2}^{\infty} \frac{1}{n(\log n)^2}$ .

vi) If  $f$  is defined on  $[0, 1]$  such that  $f(x) = \begin{cases} 1 & ; x \neq \frac{1}{2} \\ 0 & ; x = \frac{1}{2} \end{cases}$  then show that  $f \in R[0, 1]$ .

vii) Let  $f(x) = x^2$  ( $0 \leq x \leq 1$ ) and  $\sigma = \left\{ 0, \frac{1}{3}, \frac{2}{3}, 1 \right\}$  be a partition of  $[0, 1]$ , compute  $U[f, \sigma]$ .

P.T.O.



2. Attempt **any two** of the following :

10

i) If  $\sum_{n=1}^{\infty} a_n$  is a series of real numbers and if  $A = \lim_{n \rightarrow \infty} \sup \sqrt[n]{|a_n|}$ , then prove that

$$\sum_{n=1}^{\infty} |a_n| < \infty \text{ provided that } A < 1.$$

ii) Using definition show that the sequence  $\{S_n\}_{n=1}^{\infty}$  is a Cauchy sequence

$$\text{where } S_n = \frac{n-1}{n+1}.$$

iii) Prove that  $\frac{1}{3\sqrt{2}} \leq \int_0^1 \frac{x^2}{\sqrt{1+x}} dx \leq \frac{1}{3}$ .

3. Attempt **any two** of the following :

10

i) If  $f$  is continuous on the closed interval  $[a, b]$  and if  $F(x) = \int_a^x f(t) dt$  ( $a \leq x \leq b$ ), then prove that  $F'(x) = f(x)$ ,  $a \leq x \leq b$ .

ii) If  $f$  is continuous on  $[0, 1]$ , then prove that  $\int_0^1 f(x) dx = \lim_{n \rightarrow \infty} \left[ \frac{1}{n} \sum_{k=1}^n f\left(\frac{k}{n}\right) \right]$ .

iii) If  $f \in R[a, b]$ , then prove that  $|f| \in R[a, b]$  and  $\left| \int_a^b f \right| \leq \int_a^b |f|$ .

4. Attempt **any one** of the following :

10

i) If  $\sum_{k=1}^{\infty} U_k(x)$  is a series of Riemann integrable functions on  $[a, b]$  which converges uniformly to  $f(x)$  on  $[a, b]$ , then prove that  $f$  is Riemann integrable on  $[a, b]$  and

$$\int_a^b f(x) dx = \sum_{k=1}^{\infty} \int_a^b U_k(x) dx. \text{ Hence show that } \int_0^{\pi} \left[ \sum_{n=1}^{\infty} \frac{n \sin nx}{e^n} \right] dx = \frac{2e}{e^2 - 1}.$$

ii) a) Discuss the uniform convergence of the sequence  $\{f_n(x)\}_{n=1}^{\infty}$  on  $[0, 1]$ , where  $f_n(x) = nx(1-x)^n$ .

b) Show that the series  $\sum_{n=1}^{\infty} x^n e^{-nx}$  is uniformly convergent on  $[0, 10]$ .



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Seat  
No.

**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**MATHEMATICS (Paper – V)**  
**MT–335 : Ordinary Differential Equations**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

**N.B. :** i) *All questions are compulsory.*  
ii) *Figures to the right indicates full marks.*

1. Attempt **any five** of the following : **10**

- i) Solve the differential equation  $y \log y dx - x dy = 0$ .
- ii) Find the integrating factor of the differential equation  $(x+2) \sin y dx + x \cos y dy = 0$ .
- iii) Find the orthogonal trajectories of  $y = mx$ .
- iv) Find the general solution of  $y'' + y' = 0$ .
- v) Locate and classify singular points of the differential equation  $x^2 y'' + (2-x)y' = 0$ .
- vi) Replace the differential equation  $xy'' - x^2 y' - x^3 y = 0$  by an equivalent system of first order equations.
- vii) Show that  $x = e^{3t}$ ,  $y = e^{3t}$  and  $x = e^{2t}$ ,  $y = 2e^{2t}$  are solutions of the homogeneous system  $\frac{dx}{dt} = 4x - y$ ,  $\frac{dy}{dt} = 2x + y$ .

2. Attempt **any two** of the following : **10**

- i) Define linear differential equation of first order and explain the method of solving it.
- ii) Solve the differential equation  $(x^2 - 2y^2) dx + xy dy = 0$ .
- iii) Using the method of reduction of order, solve the differential equation  $yy'' + (y')^2 = 0$ .

P.T.O.



3. Attempt **any two** of the following : 10

i) Explain the method of variation of parameters to solve the differential equation  $y'' + p(x)y' + q(x)y = r(x)$ .

ii) Solve the differential equation  $y'' + 3y = 3 \sin x$  by using the method of undetermined coefficients.

iii) Verify that  $y_1 = x^2$  is one solution of  $x^2y'' + xy' - 4y = 0$  and then find  $y_2$  and a general solution by using a known solution  $y_1$ .

4. Attempt **any one** of the following : 10

i) a) Find a power series solution of the form  $\sum_{j=0}^{\infty} a_j x^j$  of the differential equation

$$xy' = y.$$

b) Find the general solution of the system  $\frac{dx}{dt} = -3x + 4y, \frac{dy}{dt} = -2x + 3y$ .

ii) Show that the equation  $x^2y'' - 3xy' + (4x + 4)y = 0$  has only one Frobenius series solution. Find it.

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[4117] – 308

Seat No.	
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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**MATHEMATICS (Paper – VII) (Ele. – I)**  
**MT – 337 (E) : Combinatorics**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

**N.B. :** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*

1. Attempt **any five** of the following : **10**

- i) Find the number of ways to arrange 13 letters in 'COMBINATORICS'.
- ii) Find the roots of the characteristic equation associated with recurrence relation  $a_{n+1} - a_n + 2a_{n-1} = 0$   $n > 1$ .
- iii) How many non-negative integer solutions are there of  $x_1 + x_2 = 7$  ?
- iv) How many 3 digit sequences can be formed using the digits 0, 1, ..., 9 with repetition ?
- v) Find the number of ways to select 3 students and 1 teacher from a set of 40 students and 3 teachers.
- vi) How many one-one functions are there from the set  $\{1, 2, 3, 4, 5\}$  to  $\{1, 2, \dots, 20\}$  ?
- vii) Find the number of ways to distribute 4 identical balls among 3 children.

2. Attempt **any two** of the following : **10**

- i) Find the coefficient of  $x^7$  in the expansion of  $(x + x^2 + x^3)^5$ .
- ii) Solve the recurrence relation  $a_n - 2a_{n-1} = 8a_{n-2}$ ;  $a_0 = 1$ ,  $a_1 = 2$ .
- iii) Prove by combinatorial argument that  ${}^nC_2 = {}^kC_2 + {}^{n-k}C_2 + k(n-k)$   
 $2 \leq k \leq n$ .

P.T.O.



3. Attempt **any two** of the following : 10

- i) How many numbers are there from 1 to 10000 which are neither divisible by 4 nor by 7 ?
- ii) Show that given any 51 numbers from the set  $\{1, 2, \dots, 99\}$  there exist two of them whose sum is divisible by 100.
- iii) How many ways are there to pick 4 cards from a standard 52 card deck such that atmost one card is Heart and no card is King ?

4. Attempt **any one** of the following : 10

- i) State and prove the principle of Inclusion and Exclusion for n sets.
- ii) a) What is the probability that an arrangement of 26 letters from a to z has
  - 1) the sequence 'abc'
  - 2) 'a' somewhere before 'b'.
- b) Find the number of integer solutions of  $x + y + z + w = 15$  with  $-6 \leq x < 2$ ,  $2 \leq y < 6$ ,  $6 \leq z < 10$ ,  $10 \leq w < 15$ .

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Seat No.	
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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**MATHEMATICS (Paper – VII) (Ele. – I)**  
**MT-337 (D) : Differential Geometry**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

**N.B. :** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*

1. Attempt **any five** of the following : **10**

i) State isoperimetric inequality for plane curves.

ii) Show that the following curve is unit speed

$$r(t) = \left( \frac{4}{5} \cos t, 1 - \sin t, \frac{-3}{5} \cos t \right).$$

iii) Show that every isometry is a conformal map.

iv) Give example of a simple closed curve.

v) State Frenet-Serret equations.

vi) Find Cartesian equation of the following curve  $r(t) = (\cos^3 t, \sin^3 t)$ .

vii) Give parametrisation of the parabola  $y = x^2$  which is not regular.

2. Attempt **any two** of the following : **10**

i) Let  $\bar{r}(t)$  be a regular curve in  $\mathbb{R}^3$ . Prove that its curvature is  $K = \frac{\|\ddot{\bar{r}} \times \dot{\bar{r}}\|}{\|\dot{\bar{r}}\|^3}$ .

ii) Compute the torsion of the circular helix  $r(\theta) = (a \cos \theta, a \sin \theta, b\theta)$ .

iii) Show that the quadric  $x^2 + 2y^2 + 6x - 4y + 3z = 7$  is a smooth surface with an atlas consisting of the single surface patch.

P.T.O.



3. Attempt **any two** of the following : 10
- i) The second fundamental form of a surface patch  $\sigma$  is zero everywhere. Prove that  $\sigma$  is part of a plane.
  - ii) Let  $\gamma$  be a unit speed curve in  $\mathbb{R}^3$  with constant curvature and zero torsion. Show that  $\gamma$  is a part of a circle.
  - iii) Prove that a parametrised curve has unit speed reparametrisation if and only if it is regular.
4. Attempt **any one** of the following : 10
- i) a) State and prove Meusnier's theorem.  
b) Find the first fundamental form of  $\sigma(u, v) = (\cos u \cos v, \cos u \sin v, \sin u)$ .
  - ii) a) Let  $U_1$  and  $U_2$  be open subsets of  $\mathbb{R}^2$  and let  $\sigma : U_1 \rightarrow \mathbb{R}^3$  be a regular surface patch let  $\phi : U_2 \rightarrow U_1$  be a bijective smooth map with smooth inverse map  $\phi^{-1} : U_1 \rightarrow U_2$ . Prove that  $\sigma \circ \phi : U_2 \rightarrow \mathbb{R}^3$  is regular surface patch.  
b) Calculate the arc length of a logarithmic spiral  $r(t) = (e^t \cos t, e^t \sin t)$  starting at  $r(0) = (1, 0)$ .



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Seat No.	
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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**PHYSICS (Paper – I)**  
**PH : 331 : Mathematical Methods in Physics**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- N.B.:** i) **All questions are compulsory.**  
ii) **Figure to the right indicate full marks.**  
iii) **Use of log-tables and calculators is allowed.**

1. Attempt **all** of the following (**one mark each**) : **10**

- a) What is partial differential equation ?
- b) State Fuch's theorem.
- c) State whether the following equation is linear or non-linear.

$x^2y'' + e^xy' + (x^2 - 1)y = 0$ . State its order.

- d) State generating function of Legendre polynomial.
- e) State expression of  $\vec{\nabla} \times \vec{F}$  in orthogonal curvilinear co-ordinates.
- f) If  $\hat{e}_\rho = \cos \rho \hat{i} + \sin \rho \hat{j}$  and  $\hat{e}_\phi = -\sin \rho \hat{i} + \cos \rho \hat{j}$ , then prove that  $\hat{e}_\rho \cdot \hat{e}_\phi = 0$ .
- g) What do you mean by co-ordinate system ?
- h) State Galilean transformation equations.
- i) A rocket ship leaves the earth at a speed of 0.98 C. How much time does it take for minute hand of a clock in ship to make complete revolution as measured by an observer on the earth ?
- j) What is meant by length contraction ?

P.T.O.



2. Attempt **any two** of the following (**5 each**) : **10**
- a) Show that expression  $x^2 + y^2 + z^2 = c^2t^2$  is invariant under Lorentz transformation equations.
- b) In spherical polar - coordinate system  $x = r \sin \theta \cos \phi$ ,  $y = r \sin \theta \sin \phi$  and  $z = r \cos \theta$ , then verify the mutual orthogonality of  $\frac{\partial \vec{r}}{\partial r}$ ,  $\frac{\partial \vec{r}}{\partial \theta}$  and  $\frac{\partial \vec{r}}{\partial \phi}$ .
- c) Prove that  $J_n(x) = (-1)^n J_n(-x)$ .
3. Attempt **any two** of the following (**5 each**) : **10**
- a) Show that the point  $x = 0$  is an regular singular point of differential equation  $x^2y'' + xy' + (x^2 - n^2)y = 0$ .
- b) Separate the variables in one dimensional wave equation  $\frac{\partial^2 u}{\partial x^2} = \frac{1}{v^2} \frac{\partial^2 u}{\partial t^2}$ .
- c) Explain twin paradox and Barn-ladder paradox.
4. A) Attempt **any one** of the following : **8**
- a) Obtain series solution around  $x = 0$  of the differential equation  $2x^2y'' - xy' + (x - 5)y = 0$  for any one case.
- b) Explain whether the point at  $\infty$  is an ordinary point or a singular point of the Hermite differential equation  $y'' - 2xy' + 2\lambda y = 0$ .
- B) Attempt **any one** of the following : **2**
- a) Show that  $H_n(0) = 0$  if  $n$  is odd.
- b) Draw neat diagram to show co-ordinate surfaces and co-ordinate curves in cylindrical curvilinear co-ordinate system.



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Seat  
No.

**T.Y.B.Sc. (Semester – III) Examination, 2012**  
**PHYSICS (Paper – V)**  
**PH-335 : 'C' Programming and Computational Physics**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- N.B.:** i) **All questions are compulsory.**  
ii) **Figures to the right indicate full marks.**  
iii) **Flowchart may be drawn with pencil.**  
iv) **Use of log-table and calculator is allowed.**

1. Attempt **all** of the following (**one mark each**) : **10**
- a) State use of break statement.
  - b) Write syntax for do... while loop.
  - c) State difference between ++i & i++.
  - d) Identify valid integers from the following  
2.3, 23, 0.023, 230
  - e) Give the syntax of printf statement.
  - f) What is conditional operator ?
  - g) What is the use of clrscr( ) function ?
  - h) State any two symbols with their uses in flowchart.
  - i) What is static variable ?
  - j) What is curve fitting ?
2. Attempt **any two** of the following (**5 marks each**) : **10**
- a) Explain with suitable example the difference between while statement and for loop.
  - b) State different operators used in C-language. Give one example of each.
  - c) Draw flowchart to print first 100 integers.

P.T.O.



3. Attempt **any two** of the following (5 marks each) : 10
- a) Explain switch statement with suitable example.
  - b) What is algorithm ? Explain advantage of algorithmic approach while solving the problem.
  - c) Write 'C' program to print odd integers less than 50.

4. A) Attempt **any one** of the following : 8
- a) i) Draw flowchart for Newton-Raphson method to find the solution.  
ii) Write C-program to find square and cube of given number.
  - b) i) Find the truncation error in the series given below :

$$e^x = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \dots + \frac{x^n}{n!}$$

for first six terms in expansion and with  $x = 2.5$ .

- ii) Explain Simpson's  $\frac{1}{3}$  rule to find integration.

- B) Attempt **any one** of the following : 2
- a) Give the syntax for drawing an ellipse and rectangle.
  - b) Define pixel and resolution in graphics.







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Seat No.	
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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**CHEMISTRY (Paper – II)**  
**CH-332 : Inorganic Chemistry**  
**(2008 Pattern) (New Course)**

Time : 2 Hours

Max. Marks : 40

- Instructions :**
- 1) **All questions are compulsory.**
  - 2) Figures to the **right** indicate **full** marks.
  - 3) Actual calculations must be shown while solving the problems.
  - 4) Marks are reserved for **neat** and labelled diagrams.
  - 5) Use of log table and calculator is **allowed**.
  - 6) Atomic Numbers, H = 1, Bc = 4, N = 7, O = 8, F = 9, Cr = 24, Mn = 25, Fe = 26, Ni = 28, Co = 27.

1. Answer the following : **10**
- i) Why  $\text{Be}_2$  molecule does not exist ?
  - ii) What is the bond order in HF molecule ?
  - iii) Define : chelate.
  - iv) How many primary valencies are there in  $[\text{Co}(\text{NH}_3)_6] \cdot \text{Cl}_3$  ?
  - v) Define the term stereoisomerism.
  - vi) What is the formula for calculation of EAN ?
  - vii) What type of hybridisation is involved in the square planar complexes ?
  - viii) Give spin-only formula to measure magnetic moment.
  - ix) Calculate CFSE in Dq for  $\text{Cr}^{+2}$  ion in weak octahedral field.
  - x) What are the symmetry symbol for S and P orbitals ?
2. A) Answer **any two** of the following : **6**
- i) Give the assumptions of Werners theory.
  - ii) What are the effects of nature of ligand on the stability of the complex ?

P.T.O.



iii) Write the formula for each of the following complexes :

- Ammonium hexathiocyanato – S – Platinum (IV)
- Dichlorotetrammine cobalt (III) chloride
- Tetracarbonyl nickel (O).

B) Answer **any two** of the following :

4

- Calculate EAN in  $[\text{Fe}(\text{CN})_6]^{-4}$  and  $[\text{Cr}(\text{NH}_3)_6]^{+3}$ .
- Write short note on co-ordination position isomerism.
- Discuss the bonding in  $\text{H}_2^+$  ion on the basis of MOT.

3. Answer **any two** of the following :

10

- Discuss the bonding in NO and  $\text{NO}^+$  according to MOT. Comment on its magnetic properties.
- Discuss the factors affecting the magnitude of  $10 Dq$ .
- Explain the bonding, structure and magnetic properties of  $[\text{Zn}(\text{NH}_3)_6]^{2+}$  ion on the basis of VBT.

4. A) For  $[\text{Mn}(\text{H}_2\text{O})_6]^{3+}$  and  $[\text{Mn}(\text{CN})_6]^{3-}$  ion has  $\Delta_0$  values are  $21,000 \text{ cm}^{-1}$  and  $38,500 \text{ cm}^{-1}$  respectively. The electron pairing energy  $P$  is  $28,000 \text{ cm}^{-1}$ . State which complex is high spin and low spin, calculate magnetic moment of each complex, using splitting diagram.

6

OR

A) Answer the following :

6

- Calculate CFSE for  $d^6$  ion in weak and strong octahedral field.
- Write note on 'charge transfer spectra'.

B) Draw MO energy level diagram for  $[\text{CoF}_6]^{3-}$  and comment on its magnetic property.

4

OR

B) Answer the following :

4

- Distinguish between  $\sigma$ MOs and  $\pi$ MOs.
- Sketch the MOs formed from P and P combination of atomic orbitals.



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Seat No.	
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T.Y. B.Sc. (Semester – III) Examination, 2012  
CHEMISTRY (Paper – III)  
CH-333 : Organic Chemistry  
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

- N.B. :** i) *All questions are compulsory.*  
ii) *Figures to right indicate full marks.*  
iii) *Draw the structures and neat diagram if necessary.*

1. Answer the following :

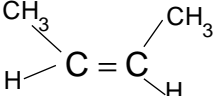
10

i) Write the trivial and IUPAC name for 

ii) Draw the resonating structure of o-nitrophenoxide ion.

iii) Why trans 1, 4 (e, e)-dimethyl cyclohexane is more stable than its cis-isomer ?

iv) Why  $\bar{\text{O}}\text{H}$  and  $\bar{\text{O}}\text{R}$  are bad leaving groups ?

v) Write the intermediate during addition of  $\text{KMnO}_4$  to 

vi) State Markovnikov's rule with suitable example.

vii) Write the reaction of 1,2-dithiols with acetone.

viii) What is oxidation ? Name any two oxidising agent.

ix) As the size of attacking base increases proportion of Hofmann product increases. Why ?

x) State Saytzeff rule.

P.T.O.



2. A) Answer **any two** of the following : 6
- Discuss the mechanism of Cannizzaro's reaction with suitable example.
  - What is hydrogen bonding ? Explain why is 2-hydroxy benzoic acid stronger than 4-hydroxy benzoic acid.
  - Discuss the mechanism of addition of HBr to propylene. Explain peroxide effect.

- B) Attempt **any two** of the following : 4
- Give the comparison between  $\text{LiAlH}_4$  and  $\text{NaBH}_4$ .
  - What is  $\text{S}_{\text{N}}1$  reaction ? Explain the mechanism of  $\text{S}_{\text{N}}1$  with suitable example.
  - Write the preparation and use of Pyridinium Chlorochromate.

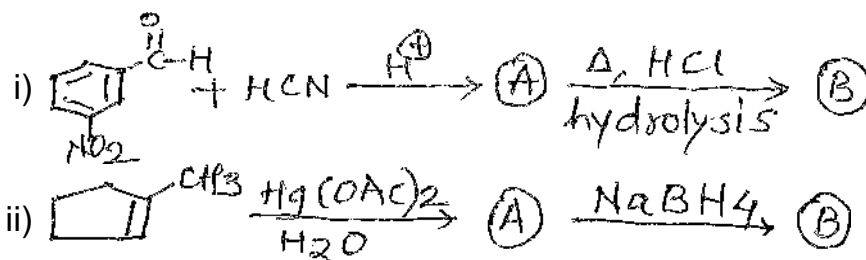
3. Attempt **any two** of the following : 10
- What is Inductive effect ? How do + I and – I effect affect the strength of acids and bases ? Explain with suitable examples.
  - Draw the chair conformations of trans 1, 2-dimethyl cyclohexane and comment on their stability and optical activity.
  - What is elimination reaction ? Discuss the mechanism of  $\text{E}_2$  reaction with suitable example. Explain Kinetic isotopic effect of  $\text{E}_2$  mechanism.

4. A) What is  $\text{S}_{\text{N}}2$  reaction ? Discuss the mechanism of  $\text{S}_{\text{N}}2$  reaction and explain any two stereochemical evidences to support  $\text{S}_{\text{N}}2$  reaction. 6

OR

- A) i) What is hydrogenation ? Discuss the formation of cis and trans alkenes from 2-butyne. 3
- ii) Explain addition-elimination reaction by giving suitable examples. 3

4. B) Predict the product with mechanism. 4



OR

- B) Write notes on : 4
- Hofmann elimination reaction
  - Ozonolysis of alkenes.



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Seat No.	
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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**BOTANY (Paper – VI)**  
**BO-336 : Cell Biology and Seed Technology**  
**(New Course) (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- Instructions :** i) **All questions are compulsory.**  
ii) **Draw neat labeled diagrams wherever necessary.**  
iii) **Figures to the right indicate full marks.**

1. Attempt the following : **10**
- a) Mitochondria are called as power house of cell. Why ?
  - b) Enlist chemical constituents of Plasma membrane.
  - c) What is phagocytosis ?
  - d) Give functions of Peroxysomes.
  - e) Enlist types of Ribosomes.
  - f) Who discovered Nucleolus ?
  - g) What is cell ?
  - h) Define seed technology.
  - i) Mention any two duties of seed inspector.
  - j) Write any two equipments used for seed sampling.
2. Answer **any two** of the following : **10**
- a) Explain the types of Lysosomes.
  - b) Differentiate between heterochromatin and euchromatin.
  - c) Describe the factors affecting seed storage.

P.T.O.



3. Write short notes on **any two** of the following : **10**

- a) Meiosis
- b) Functions of Endoplasmic reticulum
- c) Seed certification

4. What are plastids ? Explain the ultrastructure of chloroplast and add a note on its functions. **10**

OR

Define seed. Describe various classes of seed. **10**

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Seat No.	
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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**GEOLOGY (Paper – III)**  
**GL-333 : Sedimentary Petrology (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) *All questions are compulsory.*  
2) *All questions carry equal marks.*  
3) *Black figures to the right indicate full marks.*  
4) *Neat diagrams must be drawn wherever necessary.*

1. Answer the following in **2-3** lines : **10**
- a) What are placer deposits ?
  - b) Name two kinds of maturity of sediments.
  - c) Write an equation for sphericity of detrital grains.
  - d) Name any two processes of physical weathering.
  - e) Name two oxides which readily undergo mobility.
  - f) Name any two sedimentary environments.
  - g) What are nodules ?
  - h) What are quartz arenites ?
  - i) Define a 'Craton'.
  - j) Name any two varieties of cross bedding.
2. Write notes on (**any two**) : **10**
- a) Significance of ripple marks.
  - b) Classification of depositional environments.
  - c) Dott's classification of sandstones.
3. Write notes on (**any two**) : **10**
- a) Stylolites and their significance
  - b) Heavy mineral zones
  - c) Concept of dispersal based on size of sphericity.
4. Define the term provenance describe the provenance of sediments based on light and heavy mineral suites. **10**

OR

Explain different types of sedimentary facies and their hydrodynamic significance.



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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**GEOLOGY (Paper – VI) (2008 Pattern)**  
**GL-336 : Applied Geology – I (Field Geology, Remote Sensing)**

Time : 2 Hours

Total Marks : 40

- Instructions :** 1) **All** questions are **compulsory**.  
2) **All** questions carry **equal** marks.  
3) **Black figures to the right indicate full** marks.  
4) **Neat diagrams must be drawn wherever** necessary.

1. Answer the following in **2/3** lines : **10**
- a) What is block body ?
  - b) What is principal point ?
  - c) What is stereo pair ?
  - d) What is eruptive contact ?
  - e) What is an outcrop ?
  - f) What is point feature ?
  - g) What is GPS ?
  - h) What is attribute data ?
  - i) What is hyperspectral scanner ?
  - j) What does RADAR stand for ?
2. Answer **any two** of the following : **10**
- a) Write an account of sun-synchronous satellite.
  - b) Explain procedure for collecting samples during geological surveying.
  - c) Describe Enhanced Thematic Mapper.

P.T.O.





3. Answer **any two** of the following : **10**
- a) What are photogeologic characters of granite ?
  - b) Explain rectangular drainage pattern and its significance.
  - c) Explain atmospheric scattering.
4. What is aerial photography ? Discuss various factors to be considered while planning the aerial photography. **10**

OR

What do you mean by sensors ? What are two types of sensors ? Give brief account of sensors used in remote sensing. **10**



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Seat No.	
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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**STATISTICS (Principal) (Paper – VI)**  
**ST-336 (A) : Operations Management**  
**(Ele. – I) (2008 Pattern) (New Course)**

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) **All questions are compulsory.**  
2) **Figures to the right indicate full marks.**  
3) **Use of scientific calculators and statistical tables is allowed.**  
4) **Symbols and abbreviations have their usual meanings.**

1. Attempt **each** of the following :

- a) In each of the following cases choose the correct alternatives : **[1 each]**
- i) In PERT analysis variance of the project is
- A) Based on critical activities  
B) Based on non-critical activities  
C) Based on all activities  
D) Based on all dummy activities
- ii) Large number of items with small usage value in ABC analysis are
- A) B class items                      B) A class items  
C) C class items                      D) None of above
- iii) The relationship between optimistic time ( $t_o$ ), most likely time ( $t_m$ ) and pessimistic time ( $t_p$ ) is
- A)  $t_o < t_p < t_m$                       B)  $t_p < t_o < t_m$   
C)  $t_m < t_o < t_p$                       D)  $t_o < t_m < t_p$
- iv) Which of the following is not a decision making criterion
- A) Maximax                              B) Minimin  
C) Hurvitz                                D) Minimax

P.T.O.



- b) In each of the following cases, state whether the given statement is true (T) or false (F) : **[1 each]**
- Critical activities are the activities of least duration
  - In replacement model, the graph of average annual cost verses time is U shaped.
- c) Define each of the following : **[1 each]**
- Node
  - Crash cost.
- d) i) State maximax criterion of decision making.
- ii) State the formula for economic order quantity in an inventory model with uniform demand, instantaneous replenishment with shortages. **[1 each]**

2. Attempt **any two** of the following : **[5 each]**

a) The following table gives activity with their time estimates :

Activity	$t_o$	$t_m$	$t_p$
10 – 20	6	9	12
10 – 50	4	7	8
20 – 30	14	17	20
20 – 40	7	10	13
20 – 50	3	5	9
30 – 70	13	18	25
40 – 60	10	14	16
40 – 70	12	15	18
50 – 60	9	11	12
60 – 70	17	20	25

- Draw the project network.
  - What is the variance of the network/project ?
- b) Write a short note on VED analysis.



- c) An auto-rickshaw driver finds from his previous records that the cost per year of running an auto-rickshaw whose purchase price is Rs. 7,000 is as given below.

Year	Running cost ( $\alpha$ )	Resale price ( $\alpha$ )
1	1100	3100
2	1300	1600
3	1500	850
4	1900	475
5	2400	300
6	2900	300
7	3500	300
8	4100	300

At what age is the replacement due ?

3. Attempt **any two** of the following : **[5 each]**

- a) Following is the information on activity and duration of the activity. Calculate earliest start time and latest finish time. Also determine critical path and project duration.

Activity	1 – 2	1 – 3	2 – 3	2 – 4	3 – 4	2 – 5	4 – 6	5 – 6
Duration in days	6	8	4	3	0	6	10	3

- b) The researcher department of a certain company has recommended to the marketing department to launch a shampoo of three different types. The marketing manager has to decide one of the types of shampoo to be launched under the following estimated payoff for various levels of sales.

Types of Shampoo	Estimated level of sales (units)		
	15,000	10,000	5,000
Egg Shampoo	30	10	10
Clinic Shampoo	40	15	5
Delux Shampoo	55	20	3



What will be the marketing decision under :

- i) Maximum
  - ii) Laplace
  - iii) Regret criterion.
- c) Derive an expression for economic lot size with uniform rate of demand, instantaneous replenishment without shortages.

4. Attempt **any one** of the following :

- a) A small maintenance project consists of jobs in the table below, with each job is listed its normal time or crash time in days. The cost in ₹./day of each job is also given.

Job	Normal time	Crash time	Cost/day ₹.
1 – 2	9	6	20
1 – 3	9	5	25
1 – 4	15	10	30
2 – 4	5	3	10
3 – 4	10	6	15
4 – 5	2	1	40

Indirect cost is Rs. 40 per day. Draw project network and determine critical path. Crash upto 2 stages and determine the project duration.

**10**

- b) i) A firm uses every year 12,000 units of a raw materials costing Rs. 1.25 per unit. Ordering cost is Rs. 15.00 per order and the holding cost is 5% per year of average inventory.

Find the economic order quantity, further, if firm operates for 300 days per year, procurement time is 14 days and safety stock is 400 units. Find the re-order point, the maximum inventory and the average inventory.

**7**

- ii) Discuss in brief the significance of floats.

**3**

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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**STATISTICS (Principal) (Paper – VI)**  
**ST-336 (B) : Actuarial Statistics**  
**(Ele. – I) (2008 Pattern) (New Course)**

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) *All questions are compulsory.*  
2) *Figures to the **right** indicate **full** marks.*  
3) ***Use** of scientific calculators and statistical tables is **allowed**.*  
4) *Symbols and abbreviations have their **usual** meanings.*

1. Attempt **each** of the following :

a) In each of the following cases, choose correct alternative : **[1 each]**

i) If force of mortality  $\mu$  and force of interest  $\delta$  are constants then  $\bar{A}_x$  is

- |                             |                               |
|-----------------------------|-------------------------------|
| A) $\delta$                 | B) $\mu$                      |
| C) $\frac{1}{\mu + \delta}$ | D) $\frac{\mu}{\mu + \delta}$ |

ii) Loss at issue  $l(t)$  is always a following function

- |               |               |
|---------------|---------------|
| A) Constant   | B) Increasing |
| C) Decreasing | D) Step       |

iii) Discount function  $V$  and instantaneous rate of interest  $\delta$  are related by

- |                      |                       |
|----------------------|-----------------------|
| A) $V = e^{\delta}$  | B) $V = \log \delta$  |
| C) $V = e^{-\delta}$ | D) $V = -\log \delta$ |

iv) The relationship between  $A_x$  and  $\bar{A}_x$  is

- |   |   |
|---|---|
| A) $\bar{A}_x = \frac{\delta}{i} A_x$   | B) $\bar{A}_x = \frac{i^2 A_x}{\delta}$ |
| C) $\bar{A}_x = \frac{i A_x^2}{\delta}$ | D) $\bar{A}_x = \frac{i}{\delta} A_x$   |



b) In each of the following cases, state whether the given statement is **true** or **false** : [1 each]

i) The function  $\mu_x = Kx^n$ ;  $K > 0$ ,  $n > 0$  is a force of mortality.

ii) If  $Y = \bar{a}_{\overline{T}|}$  then distribution function of  $y$  is given by

$$F_y(y) = P \left[ T \leq - \frac{\log(1 - \delta y)}{\delta} \right].$$

c) Explain each of the following terms : [1 each]

i) Speculative risk

ii) Actuary.

d) Explain the meaning of the following symbols : [1 each]

i)  $\bar{a}_x$

ii)  $e_x^0$ .

2. Attempt **any two** of the following : [5 each]

a) Show that the condition for mutually advantageous policy is  $G \geq \mu$  where  $G$  represents one time premium and  $\mu$  stands for expected value of loss random variable stating appropriate assumptions.

b) i) Obtain accumulated value of Rs. 36,000/- at the end of 5<sup>th</sup> year with effective rate of interest 7.5% per annum.

ii) With effective rate of interest 10% per annum obtain present value of Rs. 20,000/- due at the end of 4<sup>th</sup> year and effective rate of discount in 3<sup>rd</sup> year.

c) Under the assumption of uniformity of deaths in unit interval of time, find

$\mu_{62.5}$  and  ${}_{1.5}p_{61}$  given that

$$l_{61} = 4952, l_{62} = 4800, l_{63} = 4609$$

3. Attempt **any two** of the following : [5 each]

a) Explain concept of pure risk. Discuss the characteristics of pure risk.

b) Examine whether the following can serve as survival functions for  $x \geq 0$ .

i)  $s(x) = \exp \{x - 0.7 (2^x - 1)\}$

ii)  $s(x) = \frac{1}{(1+x)^2}$

iii)  $s(x) = \exp \{-x^2\}$ .



c) Survival rates  $p_x$  for a certain population are given below :

<b>Age in years (X)</b>	0	1	2	3	4	5
<b><math>p_x</math></b>	0.85	0.80	0.40	0.50	0.20	0

- i) Construct the columns  $l_x$ ,  $L_x$  and  $T_x$  for a cohort of 1,00,000.
- ii) What is the probability that an individual will service at most 2 years ?

4. Attempt **any one** of the following :

a) I) Explain the following forms of annuity related to life insurance :

- i) whole life annuity
- ii) temporary life annuity
- iii) deferred annuity
- iv) immediate annuity.

6

II) Explain the notation of utility function in feasibility of insurance business.

4

b) I) Under the assumption of constant force of mortality  $\mu$  and constant force of interest  $\delta$ , find

- i)  $\bar{a}_x$
- ii)  $\text{Var} \left[ \bar{a}_{\overline{T}|} \right]$

6

II) For a fully continuous whole life insurance 1 on (x),  $\mu_x(t) = 0.04$  and  $\bar{A}_x = 0.4$ . If the premiums are calculated by equivalence principle, obtain variance of loss random variable L.

4

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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**GEOGRAPHY (Paper – II)**  
**Gg-332 : Geography of Travel and Tourism (New) (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- N.B.:** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*  
3) *Diagrams and maps must be drawn wherever necessary*  
4) *Use of map stencils is allowed.*

1. Answer the following questions in **one** or **two** sentences : **10**
- a) State any two consequential elements of tourism.
  - b) What is sea side resort ?
  - c) What is meant by relative location ?
  - d) Define the concept of market reliability.
  - e) State any two impact of slope on tourism.
  - f) Who is the domestic tourist ?
  - g) State the most common purpose of travel in India.
  - h) Mention any two natural features as tourist attraction from Maharashtra.
  - i) Mention any two socio-economic characteristic of tourism.
  - j) Mention any two lakes in India.
2. Write short answers (**any two**) : **10**
- a) Describe the different types of tourist activity.
  - b) Discuss accessibility with reference to time, cost and distance.
  - c) Differentiate travel from tourism.
3. Write short notes (**any two**) : **10**
- a) Nationality in tourism.
  - b) Purpose of travel.
  - c) Lakes and tourism.
4. Explain the major attraction of tourism resources. **10**

OR

Describe with suitable examples the impact of natural relief features on tourism.



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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**GEOGRAPHY (Paper – III)**  
**Gg-333 : Fundamentals of Geoinformatics**  
**(New) (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- N.B.:** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*  
3) *Diagrams and maps must be drawn wherever necessary.*  
4) *Use of map stencils is allowed.*

1. Answer the following questions in **one** or **two** sentences : **10**
- a) Define GIS
  - b) Name any two GIS tasks
  - c) Name data models in GIS
  - d) What is vector data ?
  - e) Explain how raster data is described.
  - f) What is database ?
  - g) What is TIN ?
  - h) What is polygon ?
  - i) What do you understand by query ?
  - j) Name any two advantages of vector data model.
2. Write short answers (**any two**) : **10**
- a) Discuss various functions of GIS.
  - b) Explain the importance of non spatial data in GIS.
  - c) Distinguish between DEM and DTM.

P.T.O.



3. Write short notes (**any two**) : **10**

a) Characteristics of raster data

b) Components of GIS

c) DEM.

4. Discuss applications of RS and GIS in agriculture.

OR

Give an account of history of GIS. **10**

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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**ELECTRONIC SCIENCE (Paper – I)**  
**EL-331 : Advanced Digital System Design**  
**(New) (2008 Pattern)**

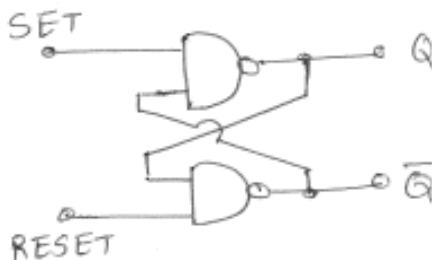
Time : 2 Hours

Max. Marks : 40

- N.B. :**
- i) **All** questions are **compulsory**.
  - ii) **Neat** diagrams must be drawn **wherever** necessary.
  - iii) Figures to the **right** indicate **full** marks.
  - iv) Use of calculator is **allowed**.

1. Answer **all** of the following :

- a) What do you mean by incompletely specified state table ? 1
- b) State the requirement of fundamental mode asynchronous sequential machine. 1
- c) List four SPLD's. 1
- d) Write the syntax for architecture body in case of VHDL. 1
- e) Find the number of non equivalent state assignments with four state and two state variables. 2
- f) "Asynchronous sequential machines are faster than synchronous sequential machine". Comment. 2
- g) "PAL has reprogrammable AND array, whereas GAL has programmable AND array". Comment. 2
- h) Write entity construct for RS flip-flop given as follows. 2



P.T.O.



2. Answer **any two** of the following :

- a) With the help of flowchart, explain designing of a modern digital system. **4**
- b) Explain implication chart state reduction technique using suitable example. **4**
- c) What is data synchronizer ? Explain how D-flip-flop is used as data synchronizing circuit for asynchronous data input to synchronous system. **4**

3. Answer **any two** of the following :

- a) Draw the general structure of PAL and explain it. State the advantages of PAL over PLA. **4**
- b) Explain Race and Cycle in case of asynchronous sequential machine. **4**
- c) What is the purpose of merger graph ? Explain the procedure how to draw merger graph with the help of suitable incompletely specified state table. **4**

4. Answer **any two** of the following :

- a) Draw the block diagram of automatic tablet filling system and explain its working. **6**
- b) Why mixed operating mode technique is used to design the asynchronous sequential circuit. Draw the logic diagram for mixed operating mode flip flop and explain it. **6**
- c) i) Draw the block diagram of asynchronous sequential circuit. Label input variables, output variables, excitation variables and state variables. **6**  
 ii) Write short note on SPLD. **6**

OR

4. Answer the following :

- a) For the given combinational logic functions, design PAL

$$Z_1 = \overline{A}\overline{B}\overline{C}D + ABC\overline{C}$$

$$Z_2 = BC + \overline{A}\overline{D}$$

$$Z_3 = \overline{A}\overline{B}\overline{C} + ABCD$$

- b) Write the program in VHDL for 1 to 2 demultiplexer using data flow modeling. **4**



c) Reduce the following state table using equivalence class state reduction technique.

4

Present state	Next state/output			
	xy = 00	xy = 01	xy = 10	xy = 11
a	a/0	a/0	b/1	c/0
b	a/0	b/0	d/0	f/1
c	c/0	b/0	b/1	a/0
d	d/0	c/0	e/1	c/0
e	a/0	e/0	b/1	c/0
f	e/0	e/0	f/0	f/0

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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**ELECTRONIC – SCIENCE (Paper – II)**  
**EL – 332 : Microcontrollers**  
**(New) (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- Instructions:** 1) *All questions are compulsory.*  
2) *Neat diagrams must be drawn wherever necessary*  
3) *Figures to the right indicate full marks.*  
4) *Use of calculator is allowed.*

1. Answer **all** of the following :

- a) State the bit addressible area of RAM in 8051  $\mu$  C. 1
- b) For how many oscillator periods, RST pin is made high for resetting 8051  $\mu$  C. 1
- c) With XTAL = 11.0592 MHz, what hex value should be loaded into TH1 to have 9600 baud rate ? 2
- d) List the derivatives of 8051  $\mu$  C family. 1
- e) State the addressing mode of instruction MOV R<sub>2</sub>, # 04H. 1
- f) If A = 55 H cy = 1, then after execution of instruction RRC A, what will be the content of A ? 2
- g) What is the function of cross-compiler ? 2
- h) What do you mean by 20 x 4 LCD ? 2

2. Answer **any two** of the following :

- a) Enlist various Flags in 8051  $\mu$  C. Discuss the function of each Flag. 4
- b) Draw the Internal architecture of 8051  $\mu$  C. State its salient features. 4
- c) Write a program to create a square wave of 50% duty cycle on bit 0 of port 1. 4

P.T.O.



3. Answer **any two** of the following :

- a) Draw and explain port structure of port 0 of 8051  $\mu$  C. 4
- b) Explain simulator and emulator used as a development tool for programming of 8051  $\mu$  C. 4
- c) Explain DA A instruction with suitable example. 4

4. Answer **any two** of the following :

- a) Interface 8 bit DAC to 8051  $\mu$  C and write a program to generate sawtooth waveform. 6
- b) Interface 4 k byte ROM to 8051  $\mu$  C. Give its memory map. 6
- c) Draw a Flowchart and write a program to find smallest number out of 10 given numbers in an array. 6

OR

4. Answer **all** of the following :

- a) Explain the following instructions with suitable example
  - i) DIV AB
  - ii) CLR A
  - iii) XCHD A, @R<sub>0</sub>
  - iv) SUBB A, @R<sub>0</sub>. 4
- b) Write a program to add the first ten numbers. 4
- c) For 8051  $\mu$  C of 11.0592 MHz crystal, find how long it takes to execute each of the following instructions : 4
  - i) MOV R<sub>3</sub>, # 55H
  - ii) DEC R<sub>3</sub>
  - iii) DJNZ R<sub>2</sub>, target
  - iv) NOP



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Seat  
No.

**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**DEFENCE AND STRATEGIC STUDIES (Paper – II)**  
**DS-332 : Defence Economics (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

***N.B.*** :1) ***All questions are compulsory.***

2) ***Figures to the right indicate full marks.***

1. Answer in **2** or **4** sentences **each** : **16**
  - 1) What do you know about Indian Economy ?
  - 2) Define “War Finance”.
  - 3) What do you mean by Ratio of Development ?
  - 4) What is Taxation ?
  - 5) State the meaning of Blockade.
  - 6) What do you mean by Threat perception ?
  - 7) State the meaning of “Rationing”.
  - 8) What do you mean by planning ?
  
2. Answer in **8** or **10** sentences (**any two**) : **8**
  - 1) Explain the significance of “Leadership”.
  - 2) Distinguish between planing and programming.
  - 3) Write in short the concept of Defence Budget.
  
3. Write short notes on (**any two**) : **8**
  - 1) Concept of War Finance.
  - 2) Salient features of Indian Economy.
  - 3) Wartime economy.
  
4. Answer in **16** to **20** sentences (**any one**) : **8**
  - 1) Explain any four determinants of India’s Defence expenditure.
  - 2) Define Economic Warfare and explain its significance in the present context.



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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**DEFENCE AND STRATEGIC STUDIES (Paper – VII)**  
**DS-337(A) : Military Sociology (Optional)**  
**(Ele. – II) (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

**N.B. :** i) *All questions are compulsory.*  
ii) *Figures to the right indicate full marks.*

1. Answer in **2 to 4** sentences **each** : **16**
  - 1) Define 'Group'.
  - 2) Define 'Gallantry'.
  - 3) Define 'Fatigue'.
  - 4) How military is composed ?
  - 5) What is 'Institution' ?
  - 6) Define 'Occupation'.
  - 7) How society is formed ?
  - 8) What is Homogenous Society ?
2. Answer in **8 to 10** sentences (**any two**) : **8**
  - 1) How soldiers are motivated ?
  - 2) How military is a modernised group ?
  - 3) Discuss the conceptual relationship between military and society.
3. Write short notes on (**any two**) : **8**
  - 1) Image of Armed Forces
  - 2) Soldiering in India
  - 3) Military Group.
4. Answer in **16 to 20** sentences (**any one**) : **8**
  - 1) Why institutional values are necessary in Military career ? Justify.
  - 2) Discuss the social composition of Indian Armed Forces.

P.T.O.



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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**DEFENCE AND STRATEGIC STUDIES (Paper – VII)**  
**DS-337(B) : Defence Journalism (Optional)**  
**(Ele. – II) (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

***N.B. : i) All questions are compulsory.***  
***ii) Figures to the right indicate marks.***

1. Answer in **2 to 4** sentences **each** : **16**
  - 1) Define 'Editorial'.
  - 2) Define 'Comment'.
  - 3) What is 'News Analysis' ?
  - 4) What is 'Event Reporting' ?
  - 5) What is meant by electronic media ?
  - 6) Define military operation.
  - 7) What is Insurgency ?
  - 8) Define Terrorism.
  
2. Answer in **8 to 10** sentences (**any two**) : **8**
  - 1) Write the role of Directorate of Public Relation in Ministry of Defence.
  - 2) What are the responsibilities of media ?
  - 3) How media can encourage debate on Defence Matter ?
  
3. Write short notes on (**any two**) : **8**
  - 1) The Three Defence Services.
  - 2) Indian War Reporting.
  - 3) Organisation of Air H.Q.
  
4. Answer in **16 to 20** sentences (**any one**) : **8**
  - 1) Write a report of Republic Day Parade.
  - 2) How media can act as a force multiplier ? Explain.



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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**DEFENCE AND STRATEGIC STUDIES (Paper – VII)**  
**DS-337(C) : Defence Preparedness of India – I**  
**(New Course) (Ele. – II) (2008 Pattern)**

Time : 3 Hours

Max. Marks : 40

***N.B. :*** 1) Answer ***all*** the questions.  
2) Figures to the ***right*** indicate ***full*** marks.

1. Answer in **two** to **four** sentences **each** : **16**
- 1) Define Strategic Doctrine.
  - 2) Define Military Technology
  - 3) State the meaning of real cost of war.
  - 4) Write the meaning of Development.
  - 5) What do you mean by EE2.
  - 6) Define Geo-politics.
  - 7) What do you mean by strategic culture ?
  - 8) Define Air-Space Security.
2. Answer in **8** to **10** sentences (**any two**) : **8**
- 1) Explain war potential.
  - 2) Discuss India's Sea-Border.
  - 3) Explain Geo-Political Evolution of India.



3. Write short notes (**any two**) : **8**

- 1) Relationship between Science and Security.
- 2) Present status of India's Defence Industries.
- 3) India's war potential.

4. Answer in **16 to 20** sentences (**any one**) : **8**

- 1) Write a note on recent trends of India's External Security.
  - 2) Discuss India's relation with her immediate neighbours.
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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**ENVIRONMENTAL SCIENCES (Paper – V)**  
**ENV-335 : Environmental Governance and Equity : Law and Ethics**  
**(2008 Pattern) (New Course)**

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) *All questions are compulsory.*  
2) *Neat and labelled diagrams must be drawn wherever necessary.*  
3) *Figures to the right indicate full marks.*

1. Attempt the following in **1-2** lines **each** : **10**
- a) Define 'Environmental Governance'.
  - b) Write full form of 'UNCHE'.
  - c) What is the statement of 'Article 48-A' ?
  - d) Define the term 'Emission'.
  - e) Mention any one principle of 'World Summit on Sustainable Development'.
  - f) Which Act is called as 'Umbrella Act' ?
  - g) Mention any two functions of environmental laboratories.
  - h) What is the meaning of 'Non-forest purpose' ?
  - i) What is the main function of 'Government Analyst' ?
  - j) Mention a criteria for selection of 'Ecomark'
2. Write a short note on (**any two**) : **10**
- a) Environmental Ethics.
  - b) Powers of Central Government under Environment (Protection) Act.
  - c) Public Interest Litigation.

P.T.O.





3. Answer **any two** from the following : **10**
- a) What are the salient features of 'Public Liability Insurance Act, 1991' ?
  - b) Discuss the objectives of 'Ecomark' scheme.
  - c) Explain provisions of 'Forest Conservation Act'.
4. Attempt **any one** of the following : **10**
- a) Discuss in detail on the provisions of 'Water (Prevention and Control) Act, 1974.
  - b) What are the salient features of 'Wildlife (Protection) Act, 1972 ?

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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**ENVIRONMENTAL SCIENCES (Paper – VI)**  
**ENV-336 : Environmental Biotechnology – I**  
**(New Course) (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

**Instructions :** 1) *All questions are compulsory.*

2) *Neat and labeled diagrams must be drawn wherever necessary.*

3) *Figures to the right indicate full marks.*

1. Attempt the following in **1-2** lines **each** : **10**
- a) Define the term Environmental Biotechnology.
  - b) What do you understand by sustainable agriculture ?
  - c) Write two examples of biofuels.
  - d) Define droplet nuclei.
  - e) Write any two examples of deep sea microbes.
  - f) Define composting technology.
  - g) Write meaning of syntrophism in soil.
  - h) Define biopesticide.
  - i) Define the term micropropagation.
  - j) What do you understand by stabilization of biological pesticides ?

P.T.O.



2. Write a short note on (**any two**) : **10**
- a) Cartagena protocol.
  - b) Recovery of metal resources.
  - c) Process factors influencing vermicomposting.
3. Answer **any two** from the following : **10**
- a) Discuss with examples risk assessment of GMOs.
  - b) Describe various objectives of environmental biotechnology.
  - c) Explain different types of biofertilizers with suitable examples.
4. Attempt **any one** of the following : **10**
- a) Discuss in detail 'Neem Pesticides' with special emphasis on their mode of action.
  - b) Describe ecological relations of microbes with a note on measurement of microbial activity.
-



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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**PHOTOGRAPHY AND AUDIO-VISUAL PRODUCTION (Vocational)**  
**Paper – VI : Television Software**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) *All questions are compulsory.*  
2) *Draw neat and labeled diagrams wherever necessary.*  
3) *Figures to the right indicate full marks.*

1. Answer the following : 10
  - a) Differentiate between watching a TV programme and watching a movie.
  - b) When is a compact shot and an extreme close up useful ?
  - c) Discuss : 'Brainstorming'.
  - d) Discuss the importance of postproduction stage.
  - e) Which format is used for generating a social message ? Why ?
  
2. Answer **any two** of the following : 10
  - a) Give suitable examples and explain the concept of 'Following Camera'.
  - b) Give suitable examples and discuss the use of various camera angles.
  - c) Give suitable examples and distinguish between "Zoom in and Zoom out".
  
3. Write a script for 30 sec social advertisement on the following theme in the **interview format**. 10

"Importance of voting in elections"

OR
  
3. Write a script for 30 sec social advertisement on the following theme in the **documentary format**. 10

"Importance of voting in elections"
  
4. Write short notes on **any two** : 10
  - a) Drama format.
  - b) Importance of storyboarding.
  - c) Camera movements.



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**T.Y. B.Sc. (Vocational) (Semester – III) Examination, 2012**  
**ELECTRONIC EQUIPMENT AND MAINTENANCE**  
**Paper – VI : Electronic Instrumentation**  
**(2008 Pattern) (New Course)**

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) **All questions are compulsory.**  
2) **Figures to the right indicate full marks.**  
3) **Use of calculators is allowed.**

1. a) Answer the following : **(4×1=4)**
- i) In reference to a generalized measurement system, give one example of
    - a) Basic functional element
    - b) Auxiliary element.
  - ii) Name the physical input parameter measured by LVDT.
  - iii) Give classification of 'Grocer's mechanical weighing balance'.
  - iv) Define 'precision'.
- b) Comment on the following : **(2×2=4)**
- i) "Metal wire sensors (e.g. PT100) have PTC".
  - ii) "A voltmeter with higher sensitivity is less erroneous".
- c) Answer the following : **(2×2=4)**
- i) What is resolution ?
  - ii) What is dynamometer ?
2. Answer **any 2** : **(2×4=8)**
- i) Write a short note on chopper amplifier.
  - ii) Explain LDR as opto-electric transducer.
  - iii) Explain dynamic calibration of motion measuring devices.

P.T.O.



3. Answer **any 2** : **(2×4=8)**
- i) Explain hydraulic load cell for force measurement.
  - ii) Write a short note on traceability.
  - iii) Define the term impedance, give its complex and polar form expressions. Explain basic principle used in digital LCR meter.

4. Answer **any 2** : **(2×6=12)**
- i) Explain servo potentiometric type DVM.
  - ii) Write a short note on DSP with the help of a block diagram.
  - iii) Explain spectrum analyzer.

OR

4. Solve the following : **(3×4=12)**
- i) In a series L – R network; L is 10 mH and R is 100  $\Omega$ . For 1 kHz operating frequency, find its impedance in complex form.
  - ii) A PT100 has a resistance of 305.3  $\Omega$  when exposed to hot gas. Its resistance at 0 °C is 100 $\Omega$  and at 100 °C is 140.5 $\Omega$ . Determine the temperature of the hot gas. [ $\alpha$  of platinum is 0.0039/°C]
  - iii) A thermocouple was found to have linear calibration between 0 °C to 400 °C with e.m.f. at maximum temperature being 20.68 mV. Take 0 °C as cold junction. Determine the correction to be made to the indicated e.m.f., if the cold junction temperature is 25 °C.



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Seat  
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T.Y. B.Sc. (Semester – IV) Examination, 2012  
MATHEMATICS (Paper – IV)  
MT 344 : Ring Theory  
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

**N.B. :** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*

1. Attempt **any five** of the following : **10**
- The set  $\{0, 2, 4\}$  under addition and multiplication modulo 6 has unity element. Find it.
  - List all zero divisors in the ring  $\mathbb{Z}_{20}$ .
  - Let  $A$  and  $B$  be ideals of a ring  $R$ . If  $A \cap B = \{0\}$ , prove that  $ab = 0$ , when  $a \in A, b \in B$ .
  - Give an example of a ring homomorphism from  $\mathbb{Z}$  to  $\mathbb{Z}$ , with justification.
  - Determine whether  $f(x) = x^2 + x + 1$  is irreducible over  $\mathbb{Z}_4$ .
  - Construct a multiplication table for  $\mathbb{Z}_2[i]$ , the ring of Gaussian integers modulo 2.
  - In  $\mathbb{Z}[i]$ , show that 5 is not irreducible.
2. Attempt **any two** of the following : **10**
- Show that the characteristic of an integral domain is either zero or a prime integer.
  - Prove that the intersection of any collection of subrings of a ring  $R$  is a subring of  $R$ . Is the union of two subrings of  $R$ , a subring of  $R$ ? Justify.
  - Show that for every prime  $p$ ,  $\mathbb{Z}_p$  is a field.
3. Attempt **any two** of the following : **10**
- Describe the quotient ring  $2\mathbb{Z}/6\mathbb{Z}$ .
  - Let  $A$  and  $B$  be ideals of a ring  $R$ . Let  $AB = \{a_1b_1 + a_2b_2 + \dots + a_nb_n / a_i \in A, b_i \in B, n, \text{ a positive integer}\}$ . Show that  $AB$  is an ideal of  $R$ .
  - Obtain the quotient and remainder upon dividing  $f(x) = 3x^4 + x^3 + 2x^2 + 1$  by  $g(x) = x^2 + 4x + 2$  in the ring  $\mathbb{Z}_5[x]$ .

P.T.O.



4. Attempt **any one** of the following : **10**
- i) a) State and prove the Division Algorithm for  $F[x]$  where  $F$  is a field.
  - b) Let  $D$  be a Euclidean domain. Let 'd' be the associated function. Prove that 'u' is a unit in  $D$  iff  $d(u) = d(1)$ .
  
  - ii) a) Let  $R$  be a commutative ring with unity. Prove that an ideal  $A$  in  $R$  is maximal iff  $R/A$  is a field. **7**
  - b) Find all prime ideals of  $Z_{10}$ . **3**
-





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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**MATHEMATICS (Paper – VII)**  
**MT-347 : C-Programming – II (Elective – II)**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

**N.B.:** i) *All questions are compulsory.*  
ii) *Figures to the right indicate full marks.*

1. Attempt **any five** of the following : **10**
- i) Define a structure that contains the two members : a 40 – element character array called ‘time’ and an integer quantity called ‘lost’.
  - ii) Can the period operator (.) be used with an array of structures ? Explain.
  - iii) State the meaning of the following declaration : `int * (*PF) (int) ;`
  - iv) Write a macro square (a) to find square of a number.
  - v) Explain in short the use of operator bitwise AND – &.
  - vi) Define ‘a’ as an array of 100 pointers to float.
  - vii) Explain the use of function : `fgetc`.
2. Attempt **any two** of the following : **10**
- i) Summarize the rules governing the use of the `fopen` function. Describe the information that is returned by this function.
  - ii) What is the purpose of a static variable in a single file program ? What is its scope ?
  - iii) What is the relationship between an array name and a pointer ? How is an array name interpreted within the function definition.

P.T.O.



3. Attempt **any two** of the following : 10

- i) What is a macro ? Summarize the similarities and differences between macros and functions.
- ii) When parameters are passed to program from the command line, how is the program execution initiated ? Where do the parameters appear ?
- iii) Describe the bitwise operators : 1 and  $\wedge$ .

4. Attempt **any one** of the following : 10

- i) a) Trace the output if program is correct.

```
# include < stdio.h>

int main ( ) {
    char *p = "program";
    while (*p)
        printf("%s\n", p++);
}
```

- b) A C program contains the following declaration :

```
int x[8] = {20, 40, 60, 90, 80, 10, 30, 100};
```

- $\alpha$ ) What is the meaning of x ?
  - $\beta$ ) What is the meaning of (x + 2) ?
  - $\gamma$ ) What is the value of \*x + 2 ?
  - $\delta$ ) What is the value of \* (x + 2) ?
  - $\eta$ ) What is the value of \* x + 3 ?
- ii) a) Write a program to find distance between two points P(x<sub>1</sub>, y<sub>1</sub>) and Q(x<sub>2</sub>, y<sub>2</sub>). Define a point using struct.
  - b) Write a program to count number of characters in a text file.



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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**PHYSICS (Paper – II) (New) (2008 Pattern)**  
**PH – 342 : Quantum Mechanics**

Time : 2 Hours

Max. Marks : 40

- N.B. :** i) *All questions are compulsory.*  
ii) *Figures to the right indicate full marks.*  
iii) *Use of log-table and calculator is allowed.*

1. Attempt **all** of the following (**one mark each**) : **10**

- a) The electrons are allowed to pass through a crystal with lattice constant  $1 \text{ \AA}$ . Determine uncertainty in its velocity. ( $h = 6.63 \times 10^{-34} \text{ Js}$ ,  $m = 9.11 \times 10^{-31} \text{ kg}$ ).
- b) Prove the relation  $\lambda = \frac{h}{p}$  for a particle having momentum  $p$ .
- c) State normalisation condition for wave function  $\psi$ .
- d) Define operator in quantum mechanics.
- e) State any two applications of tunneling effect.
- f) What is meaning of degenerate state ?
- g) Write Schrodinger's time independent equation.
- h) State different quantum numbers.
- i) Prove that  $[x, P_y] = 0$ .
- j) What do you mean by even and odd parity ?

2. Attempt **any two** of the following (**five marks each**) : **10**

- a) Prove that  $[\hat{A}, [\hat{B}, \hat{C}]] + [\hat{B}, [\hat{C}, \hat{A}]] + [\hat{C}, [\hat{A}, \hat{B}]] = 0$ .
- b) Calculate expectation value of potential energy in ground state of hydrogen

atom if  $\psi_{100} = \frac{1}{\sqrt{\pi a_0^3}} e^{-r/a_0}$ .

- c) A small object of mass  $1 \mu\text{g}$  is confined to move between two rigid walls separated by distance  $1 \text{ mm}$ . Calculate minimum speed of the object.

P.T.O.



3. Attempt **any two** of the following (**five marks each**) : **10**

a) Prove the uncertainty relation  $\Delta L \cdot \Delta \theta \geq \hbar$ .

b) Normalise the wave function  $\psi(x) = \frac{1+ix}{1\pm ix^2}$  if range of  $x$  is from  $-\infty$  to  $+\infty$ .

c) Check whether  $e^{2x}$  is eigen function of operator  $\frac{d^2}{dx^2}$ . If so determine its eigen value.

4. A) Attempt **any one** of the following : **8**

a) For the potential barrier

$$V = 0, \quad \text{if } x < 0$$

$$V = V_0, \quad \text{if } 0 \leq x \leq a$$

$$V = 0, \quad \text{if } x > a.$$

Apply Schrodinger's equation to it for  $E > V_0$  and show that  $R + T = 1$  for it.

b) Obtain equation of continuity and give its physical significance. **8**

B) Attempt **any one** of the following : **2**

a) Show that  $V_g = V_p - \lambda \frac{dV_p}{d\lambda}$ .

b) State requirements of wave function to be acceptable solution of Schrodinger's time independent equation.



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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**PHYSICS (Paper – VI (A)) (Elective – II)**  
**PH – 346 : Electro Acoustics and Entertainment Electronics**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- N.B. :** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*  
3) *Use of log table and calculator is allowed.*

1. Attempt **all** of the following (**one mark each**) : **10**
- a) Give the frequency theory of hearing.
  - b) What is the significance of cut off frequency in case of an exponential horn ?
  - c) What is articulation test ?
  - d) what is meant by Hi-Fi ?
  - e) What is meant by directivity index of a microphone ?
  - f) Give the expression for sensitivity of a carbon microphone.
  - g) Give typical frequency response of an exponential horn speaker.
  - h) What is a volume expander ?
  - i) Give two advantages of folded horns.
  - j) Draw the equivalent circuit for a direct radiator loudspeaker.
2. Attempt **any two** :
- a) Explain how is the required output power of an amplifier, to be installed in an auditorium, calculated. **5**
  - b) Write a note on bass reflex cabinet. **5**
  - c) Give strengths of medical ultrasonography. **5**

P.T.O.

3. Attempt **any two** :

- a) The frequency of mechanical response of a cone speaker is 60Hz. The stiffness of the cone system is  $1.85 \times 10^3$  N/m. Determine radiation reactance if total mass of the diaphragm and voice-coil is 11 gm. **5**
- b) A direct radiator dynamic loudspeaker has a radiation resistance of 2 kg/s. Its voice-coil is 7.5 m in length and suspended in a magnetic field of 1.0 Wb/m<sup>2</sup>. Determine the acoustic power output for a current of 2A, if the mechanical impedance is 13.3 Kg/s. **5**
- c) On a level detector type reverberation time measuring instrument, the upper and lower levels are 2.1 volts and 1.1 volts respectively. If the time elapsed between the two levels is 0.11 sec, determine the reverberation time. **5**

4. A) Attempt **any one** :

- a) Discuss the effect of voice-coil parameters on the acoustic output of direct radiator loudspeakers. **8**
- b) Compare variable area and variable density motion picture sound recording systems. **8**

B) Attempt **any one** :

- a) Distinguish between voiced and unvoiced sounds. **2**
- b) Write a note on audio delay. **2**
-



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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**PHYSICS (Paper – VI (B))**  
**PH-346 : Renewable Energy Sources (Elective – II)**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- N.B. :** i) *All questions are compulsory.*  
ii) *Figures to the right indicate full marks.*  
iii) *Use of log tables and calculator is allowed.*

1. Attempt **all** of the following (**one mark each**) : **10**
- a) What are advantages of photovoltaic system ?
  - b) Define fill factor of solar cell.
  - c) What are conventional sources of energy ?
  - d) State principle of wind turbine.
  - e) State different types of solar cell.
  - f) Define maximum conversion efficiency.
  - g) What is biomass ?
  - h) What are the principle of solar dryer ?
  - i) Define solar collector.
  - j) What is the wavelength at which Silicon cell start to absorb light ?  
[Given :  $E_g = 1.1 \text{ eV}$  ;  $h = 6.63 \times 10^{-34} \text{ Js}$  ;  $1 \text{ eV} = 1.6 \times 10^{-19} \text{ J}$ ]
2. Attempt **any two** :
- a) Draw a neat diagram of structure of the sun. Explain the electromagnetic energy spectrum. **5**
  - b) Explain box type solar cooker with neat diagram. **5**
  - c) Calculate the input power of solar cell using the following data :  
 $\eta = 12\%$   
 $V_{oc} = 450 \text{ mV}$   
 $I_{sc} = 30 \text{ mA}$   
 $F.F. = 0.7.$  **5**



3. Attempt **any two** :
- a) Explain in detail vertical axis type wind mills. 5
  - b) Explain the term solar radiation at the earth surface. 5
  - c) Describe the construction and working of liquid flat plate collectors. 5
4. A) Attempt **any one** :
- a) Explain I – V characteristic of solar cell and hence define fill factor (F.F.) and maximum conversion efficiency. 8
  - b) Explain the methods for obtaining energy from Biomass. Also define gasifier. 8
- B) Attempt **any one** :
- a) What is energy audit ? 2
  - b) In a solar spectrum, the brightest line has wavelength of 4785 AU. If Wiens constant is  $2.9 \times 10^{-3} \text{ m}^\circ\text{K}$  find the surface temperature of the sun. 2
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**T.Y. B.Sc. (Semester – IV) Examination, 2012  
PHYSICS (Paper – VI (C)) (New) (2008 Pattern)  
PH – 346 : (Elective – II) : Physics of Nanomaterials**

Time : 2 Hours

Max. Marks : 40

- N.B. :** 1) **All questions are compulsory.**  
2) **Figures to the right indicate full marks.**  
3) **Use of log table and calculator is allowed.**

1. Attempt **all (one mark each)** : **10**
- a) What is the meaning of the word 'nano' ?
  - b) Name the scientist who delivered the historical talk "there's plenty of room at the bottom".
  - c) Give an example of property of gold nano particles which is different from bulk gold.
  - d) Name the formula used for determination of particle size of nanoparticles.
  - e) Range of interplaner distances is of the order of wavelength of which electromagnetic radiation ?
  - f) State any one characterization technique of nanoparticles with its function.
  - g) Give an example of bottom up approach of nanoparticles synthesis.
  - h) Which method is generally used for the synthesis of porous silicon ?
  - i) Give an example of carbon nanostructure.
  - j) Name any one nanomaterial prominently used in cosmetics.
2. Attempt **any two** :
- a) State and prove Bragg's law. Using Bragg's law, determine the angle for first and second order of X-ray diffraction if  $\text{CuK}\alpha$  ( $\lambda = 1.5 \text{ \AA}$ ) radiation is used. (Given :  $d = 30 \text{ nm}$ ) **5**
  - b) Describe the formation of porous Silicon. **5**
  - c) Write short notes on the following synthesis methods : **5**
    - i) Chemical Vapor Deposition (CVD)
    - ii) Sol-gel-method.



3. Attempt **any two** :

- a) Define density of states and illustrate density of states for 5
  - i) One-dimensional solid (quantum wire)
  - ii) Two-dimensional potential box
  - iii) Particle in a 3-dimensional potential box.
- b) Compare electrical properties of bulk and nanomaterials. 5
- c) What applications do nanomaterials have in medical and electronics field. 5

4. A) Attempt **any one** :

- a) Describe in detail UV – Visible – NIR spectroscopy. 8
- b) Describe the synthesis, properties and applications of carbon nanotubes. 8

B) Attempt **any one** :

- a) Name any two milestones in the development of nanotechnology. 2
- b) Compare top-down and bottom up approach of synthesis of nanomaterials. 2

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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**PHYSICS (Paper – VI (D))**  
**PH – 346 : (Elective – II) : Lasers**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

**N.B. :** i) **All questions are compulsory.**  
ii) **Figures to the right indicate full marks.**  
iii) **Use of log tables and calculators is allowed.**

1. Attempt **all** of the following (1 mark each) : **10**
    - a) Explain stimulated absorption.
    - b) Draw diagram of four level pumping.
    - c) What is optical feed back ?
    - d) Define monochromaticity.
    - e) State use of laser in defence.
    - f) State use of laser in industry.
    - g) State materials used in Ruby laser.
    - h) What is population density ?
    - i) State condition for light amplification.
    - j) State use of laser in medical science.
  
  2. Attempt **any two** of the following (5 each) : **10**
    - a) Explain life time broadening in detail.
    - b) Define Einstein's coefficients and derive relations for them.
    - c) Write short note on optical resonator.
  
  3. Attempt **any two** of the following (5 each) : **10**
    - a) The half-width of gain of a He-Ne laser material is about  $2 \times 10^{-12}$  m. Find the maximum length of the cavity in order to have a single longitudinal mode oscillation.
    - b) calculate the temperature at which spontaneous and stimulated emission are equal if wavelength of radiation emitted by the source is  $6000 \text{ \AA}$ .
    - c) What is coherence ? Explain concept of spatial coherence.
  
  4. A) Attempt **any one** of the following : **8**
    - a) State different types of lasers and explain Tunable dye laser.
    - b) i) Give advantages of laser light over ordinary light.  
ii) Explain critical population inversion.
  
  - B) Attempt **any one** of the following : **2**
    - a) State uses of Diode-Laser.
    - b) Give the active medium used in He – Ne Laser.
-



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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**PHYSICS (Paper – VI (E)) (New)**  
**PH – 346 : (Elective – II) : Micro Controllers**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- N.B. :** 1) **All questions are compulsory.**  
2) **Figures to the right indicate full marks.**  
3) **Use of log tables and calculator is allowed.**

1. Attempt **all** of the following (1 mark each) : **10**
- a) Which port in 8051 needs pull-up resistors ?
  - b) What is the size of On-chip RAM and ROM in 8051 ?
  - c) State the function of ALE pin in 8051.
  - d) Enlist the flags used in 8051.
  - e) Explain the instruction DA (Decimal Adjust for addition).
  - f) What is the size of DPTR (Data Pointer) register ?
  - g) Compare LJMP with SJMP.
  - h) Convert decimal 4095 into Hex.
  - i) Compare full duplex serial data transfer with half duplex.
  - j) Explain byte framing in serial data communication.
2. Attempt **any two** of the following :
- a) How instructions grouped according to the functions they perform ? Give one example of each group in 8051. **5**
  - b) Explain Timer/counter section in 8051 in brief. **5**
  - c) What are special function registers (SFR) ? Explain any one. **5**
3. Attempt **any two** of the following :
- a) Write an Assembly Language program for converting a packed BCD number to ASCII. **5**
  - b) Write an Assembly Language Program for finding the seconds compliment of the given number. **5**
  - c) Two eight bit numbers are stored in register R3 and R4 multiply them and store the result in registers R0 and R1. **5**
4. A) Attempt **any one** of the following :
- a) Draw the block diagram of 8051 micro-controller and explain the memory (on-chip) section in it. **8**
  - b) Explain various addressing modes in 8051 with the help of examples. **8**
- B) Attempt **any one** of the following :
- a) Enlist any four SFRs (Special Function registers). Explain any one in brief. **2**
  - b) Enlist the interrupts in 8051. Explain any one in brief. **2**



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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**CHEMISTRY (Paper – I)**  
**CH-341 : Physical Chemistry**  
**(2008 Pattern) (New)**

Time : 2 Hours

Max. Marks : 40

- N.B. :** 1) *All questions are compulsory.*  
2) *Figures to **right** indicate **full** marks.*  
3) ***Use** of logarithmic table and calculator is **allowed**.*  
4) *Actual calculations must be shown while solving problems.*

1. Answer the following : **10**
- a) Explain the term 'isotope' with suitable example.
  - b) Define specific conductance.
  - c) Define single electrode potential.
  - d) Define the term electrolytic cell.
  - e) Define the term 'Curie'.
  - f) Write the cell reaction of the following cell :  
 $\text{Cd} | \text{cd}^{2+} || \text{KCl (IN), Hg}_2\text{Cl}_2 | \text{Hg}$ .
  - g) State Heisenberg's uncertainty principle.
  - h) What is zero point energy ?
  - i) Define the term average life.
  - j) A radioactive element has decay constant  $4.33 \times 10^{-4} \text{ year}^{-1}$ . Calculate half life period.
2. A) Answer the following (**any two**) : **6**
- i) State the law of radioactive disintegration. Derive the expression for radioactive decay for stable daughter nuclide.
  - ii) State and explain 'Kohlrausch's law' of independent migration of ions.
  - iii) State and deduce time independent Schrodinger equation. Explain the terms involved in it.

P.T.O.



B) Solve **any one** of the following : 4

- i) The activity of radioactive sample falls to 85% of the initial value in four years. What is the half life of the sample ?
- ii) The cell  $\text{Zn} | \text{ZnCl}_2 || \text{AgCl} | \text{Ag}$  gives following data.

emf/volts	temp °C
1.240	25
1.260	35

Predict the cell reaction and calculate  $\Delta G$ ,  $\Delta H$  and  $\Delta S$  at 25°C.

3. Attempt **any two** of the following : 10

- i) State Ohm's law. What are specific conductance and equivalent conductance of a solution ? Explain how specific conductance and equivalent conductance of electrolyte varies with concentration.
- ii) Define single electrode potential. Describe the construction and working of calomel electrode.
- iii) Describe construction and working of G.M. counter. What are its limitation ?

4. A) Write a note on 'Asymmetric effect' and 'Electrophoretic effect'. 6

OR

A) Explain various types of nuclear decay with suitable example.

B) Solve **any one** of the following : 4

- i) Find the equivalent conductance and specific conductance of NaCl of strength  $5 \times 10^{-3} \text{N}$  if the cell having cell constant  $0.68 \text{ cm}^{-1}$  is placed in it gave the resistance of 1130 Ohms.
- ii) Calculate mass defect, binding energy and average binding energy for  ${}_{26}^{56}\text{Fe}$  with atomic mass 55.975 amu.

Given –  $m_p = 1.0078 \text{ amu}$

$m_n = 1.0086 \text{ amu}$ .



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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**CHEMISTRY (Paper – IV)**  
**CH – 344 : Analytical Chemistry**  
**(New) (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- N.B. :** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*  
3) *Use of log tables and calculators is allowed.*  
4) *Neat diagrams must be drawn wherever necessary.*

1. Answer the following : 10
- 1) What is decomposition potential in polarography ?
  - 2) Give Ilkovi equation.
  - 3) What is alkaline error in pH metry ?
  - 4) Give the principle of electrophoresis.
  - 5) What is difference between GLC and GSC ?
  - 6) What is stationary and mobile phase in thin layer chromatography ?
  - 7) How the resolving power of HPLC is increased ?
  - 8) What do you understand by HPLC ?
  - 9) Give significance of parent peak obtained in mass spectroscopy.
  - 10) Define the term molecular ion in mass spectrometry.
2. A) Answer **any two** of the following : 6
- 1) Write a note on moving boundary electrophoresis.
  - 2) Discuss flame ionisation detectors in gas chromatography.
  - 3) Describe construction and working of calomel electrode.

P.T.O.



- B) Answer **any two** of the following : 4
- 1) What is current maxima in polarography ? How it is suppressed ?
  - 2) Find  $H^+$  ion concentration of a solution having pH 8.42.
  - 3) Calculate the number of sites of unsaturation in a compound  $C_9H_8O_2$ .
3. Attempt **any two** of the following : 10
- 1) Discuss various steps involved in paper chromatography.
  - 2) What is principle of GLC ? Sketch schematic diagram of the apparatus used for GLC ? Describe its component in brief.
  - 3) Explain super critical fluid chromatography. How is it superior than HPLC ? List the difference in properties and role of mobile phase in gas liquid SFC.
4. a) Explain the principle of mass spectrometry. Give various applications of it in detail. 6
- OR
- a) 1) Sketch ideal polarographic wave and explain migration current. 3
- 2) What are advantages of HPLC ? 3
- b) Calculate the conc. of  $Ni^{+2}$  in solution if  $26 \mu A$  current flows through the polarographic cell if  $m = 4 \text{ mg}\cdot\text{sec}^{-1}$ ,  $t = 6 \text{ sec}$ ,  $D = 6.9 \times 10^{-6} \text{ cm}^2\cdot\text{sec}^{-1}$ . 4
- OR
- b) In paper chromatographic experiment a compound x migrates 18.3 cm from the base line while the solvent front migrates 28.3 cm. Calculate  $R_f$  value of this compound. In case solvent front migrates 30.2 cm instead of 28.3 cm at a distance from the base line the spot will be located. 4





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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**ZOOLOGY (Paper – IV) (2008 Pattern)**  
**ZY-344 : Organic Evolution (New)**

Time : 2 Hours

Max. Marks : 40

- N.B. :** i) **All questions are compulsory.**  
ii) **Neat labelled diagrams must be drawn wherever necessary.**  
iii) **Figures to the right indicate full marks.**

1. Attempt the following : 10
- 1) Define evolution.
  - 2) What are vestigial organs ?
  - 3) What are analogous organs ?
  - 4) Define abiogenesis.
  - 5) State any two differences between man and ape.
  - 6) Who proposed the theory of chemical evolution ?
  - 7) State the law of superposition.
  - 8) Define interspecific struggle.
  - 9) Explain plastids.
  - 10) Explain palaeozoic era.
2. Attempt **any two** of the following : 10
- 1) Enlist salient features of Homo creatus.
  - 2) Explain quantum speciation.
  - 3) Describe patterns of animal distribution.

P.T.O.



3. Write notes on **any two** : **10**
- 1) Lamarckism.
  - 2) Ethiopian realm.
  - 3) Theory of spontaneous generation.
  - 4) Modern synthetic theory.

4. What is organic evolution ? Explain how the physiological evidences supporting organic evolution. **10**

OR

- What are reproductive isolations ? Explain with suitable example. **10**
-



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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**GEOLOGY (Paper – IV)**  
**GL – 344 : Geotectonics**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) *All questions are compulsory.*  
2) *All questions carry equal marks.*  
3) *Black figures to the right indicate full marks.*  
4) *Neat diagrams must be drawn wherever necessary.*

1. Answer in **2/3** lines.

**10**

- a) Define the term Benioff zone.
- b) Define magnetic dip.
- c) What is Curie temperature ?
- d) What do you mean by mountain range ?
- e) Define DRM.
- f) What is weather ?
- g) Define plate margin.
- h) Name small tectonic plates.
- i) What is low velocity zone ?
- j) Define the term cyclone.

P.T.O.



2. Write notes (**any two**) : **10**
- a) Convergent plate boundaries.
  - b) Causes of magnetic reversal.
  - c) Lithosphere.
3. Write notes on (**any two**) : **10**
- a) Epeirogenesis and orogenesis.
  - b) Transform fault boundary.
  - c) Triple junction.
4. Describe the life cycle of mountain. **10**
- OR
4. Give the causes and mechanism of plate motion. **10**



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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**STATISTICS (Principal) (Paper – V)**  
**ST 345 : Operations Research**  
**(2008 Pattern) (New Course)**

Time : 2 Hours

Max. Marks : 40

- Instructions :** i) **All questions are compulsory.**  
ii) **Figures to the right indicate full marks.**  
iii) **Use of scientific calculators and statistical tables is allowed.**  
iv) **Symbols and abbreviations have their usual meaning.**

1. Attempt **each** of the following :

a) Choose the correct alternative in each of the following : **(1 each)**

- i) In the standard form of L.P.P., the right hand side element of each constraint should be  
A) non negative  
B) zero  
C) negative  
D) one
- ii) In MODI method of optimizing T.P., when optimality criterion is satisfied, if the net evaluation in any non basis cell is zero, it indicates  
A) no solution to TP  
B) alternate solution to TP  
C) TP is balanced  
D) TP is unbalanced
- iii) In the general definition of an assignment problem,  $x_{ij}$  is always  
A) 1  
B) 1 or -1  
C) 1 or 0  
D) -1
- iv) For a L.P.P. having maximization objective function, in a simplex table,  $z_j - c_j \geq 0$  for all j indicates  
A) unique solution  
B) alternate solution  
C) optimal solution  
D) degenerate solution

P.T.O.



- b) State whether **each** of the following statements is **True** or **False** : (1 each)
- A Transportation Problem is balanced if it has equal number of rows and columns.
  - The dual of a dual is primal.
- c) Define **each** of the following : (1 each)
- A slack variable
  - Degenerate solution of a T.P.
- d) i) Explain the term 'artificial variable' and its use in linear programming. 1  
 ii) Define the idle time of a machine in case of sequencing problem. 1

2. Attempt **any two** of the following : (5 each)

- a) Solve the following L.P.P. by graphical method.

$$\text{Maximize } z = 2X_1 + 5X_2$$

Subject to

$$\begin{aligned} X_1 &\leq 4 \\ X_2 &\leq 3 \\ X_1 + 2X_2 &\leq 8 \\ X_1, X_2 &\geq 0 \end{aligned}$$

- b) A person requires at least 10, 12 and 15 units of chemicals A, B and C respectively for his garden.

A liquid product contains 5, 2 and 1 unit of chemicals A, B and C respectively per jar where as a dry product contains 1, 2 and 4 units of A, B and C per carton. The liquid product is sold for Rs. 30 per jar and the dry product is sold for Rs. 200 per carton.

Formulate above problem as L.P.P. to minimize the total cost.

- c) A ready-made garment manufacturer has to process 7 items through two stages of production cutting and sewing. The time taken for each of these items at different stages are given below in appropriate units.

Item	1	2	3	4	5	6	7
Cutting	5	7	3	4	6	7	12
Sewing	2	6	7	5	9	5	8

Determine the sequence for the items that will minimize the total elapsed time.

Compute the idle time of cutting and sewing machine.

3. Attempt **any two** of the following : (5 each)

- a) Solve the L.P.P. using simplex method.

$$\text{Maximize } Z = 5x_1 + 7x_2$$

$$\text{Subject to } X_1 + X_2 \leq 4$$

$$3X_1 - 8X_2 \leq 24$$

$$10X_1 + 7X_2 \leq 35$$

$$X_1, X_2 \geq 0$$



- b) Explain Monte Carlo method of simulation with a suitable illustration.
- c) Consider the following Transportation Problem with per unit cost of transportation as given below :

<b>To</b> <b>From</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>Supply</b>
<b>S<sub>1</sub></b>	2	7	14	4
<b>S<sub>2</sub></b>	3	3	1	8
<b>S<sub>3</sub></b>	5	4	7	7
<b>S<sub>4</sub></b>	1	6	2	15
<b>Demand</b>	7	9	18	

Obtain IBFS using VAM and check its optimality.

4. Attempt **any one** of the following

- a) i) Write the dual of following L.P.P.

Maximize  $Z = 3X_1 - 2X_2$   
 Subject to  $X_1 + X_2 \leq 5$   
 $X_1 \leq 4$   
 $1 \leq X_2 \leq 6, X_1, X_2 \geq 0$

3

- ii) A departmental head has four subordinates and four tasks to be performed. The subordinates differ in efficiency and the tasks differ in their intrinsic difficulty. The estimates of the head of the times that each man would take to perform each task is given below :

		<b>Tasks</b>			
		<b>I</b>	<b>II</b>	<b>III</b>	<b>IV</b>
<b>Subordinates</b>	A	8	25	17	11
	B	13	28	26	4
	C	38	19	18	15
	D	19	26	24	10

How should the tasks be allocated to subordinates so as to minimize total time ?

5

- iii) State the criteria used in simplex method for deciding whether L.P.P. has
  - i) an unbounded solution
  - ii) an infeasible solution

2



- b) i) A company has three warehouses  $W_1, W_2, W_3$ . It is required to deliver a product from these warehouses to three customers A, B, C. The warehouses have the following stocks,

<b>Ware house :</b>	$W_1$	$W_2$	$W_3$
<b>No. of units :</b>	8	12	14

and the requirements of the customers are

<b>Customer :</b>	A	B	C
<b>No. of units :</b>	4	4	20

The per unit transportation cost (in '00 Rs.) is as given below :

<b>To From</b>	<b>A</b>	<b>B</b>	<b>C</b>
<b><math>W_1</math></b>	4	2	3
<b><math>W_2</math></b>	5	4	5
<b><math>W_3</math></b>	6	5	4

Obtain IBFS using Least Cost Method. Revise the solution once if it is not optimal.

6

- ii) State the relation of Assignment Problem with Transportation Problem.

2

- iii) Define the general sequencing problem.

2





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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**STATISTICS (Principal) (Paper – VI)**  
**ST-346(A) : Medical Statistics (Elective – II)**  
**(2008 Pattern) (New Course)**

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) *All questions are compulsory.*  
2) *Figures to the **right** indicate **full** marks.*  
3) *Use of scientific calculators and statistics tables is **allowed**.*  
4) *Symbols and abbreviations have their usual meaning.*

1. Attempt **each** of the following :

- a) In each of the following cases, choose the correct alternative : **(1 each)**
- i) The most popular model used to represent the tendency of a population to reach a plateau is
- A) linear
  - B) exponential
  - C) sigmoidal
  - D) logarithmic
- ii) Life table provides a broad picture of
- A) only mortality
  - B) only survivorship
  - C) mortality and survivorship
  - D) fertility

P.T.O.



- iii) A study that begins with tests on animals is called as :
- A) Preclinical study
  - B) Phase I study
  - C) Phase II study
  - D) Phase III study
- iv) Pharmacokinetics (Pk) is the study of the time course of
- A) absorption
  - B) distribution
  - C) metabolism and excretion
  - D) all above
- b) In **each** of the following cases, state whether the given statement is **true** or **False** : **(1 each)**
- i) Prevalence is a measure that is more relevant to a disease that is of short duration.
  - ii) A control is a treatment that is useful as a standard for comparison.
- c) Define the following terms : **(1 each)**
- i) 75/75 rule for assessment of bioequivalence
  - ii) Blinding
- d) i) State the role of CRO. **(1 each)**
- ii) Explain the drawback of exponential growth model.
2. Attempt **any two** of the following : **(5 each)**
- a) Write a short note on 'Crossover design' used in clinical trials.
  - b) Explain in brief the discoveries in epidemiology made by the following :
    - i) William Harvey
    - ii) Florence Nightingale



c) The following table relates to the number of animals of a certain species at age  $x$  :

$x$	0	1	2	3	4	5
$l_x$	1000	850	760	360	25	0

Prepare life-table containing columns  $d_x, q_x, L_x, T_x, e_x$ .

3. Attempt **any two** of the following : **(5 each)**

- a) Suppose  $\mu_C$  and  $\mu_T$  denote the mean responses of two formulations control (C) and test (T) with unknown variance. Explain how you test  $H_0 : \mu_T = \mu_C$  against  $H_1 : \mu_T > \mu_C$ . Assuming equal sample sizes for both the test groups, find the expression of sample size of each group to get power  $1 - \beta$ .
- b) Define survival function and interpret it. Also, state its properties.
- c) Consider the following data on vision grades of two eyes of 7477 women factory workers. Grade 1 represent normal vision and Grade 4 is the weakest vision. Using Bowker test, test whether there is any relation between the grade of left eye and right eye. Use 5% level of significance.

**Vision grades of eyes of women workers**

<b>Right eye</b> →	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
<b>Left eye</b> ↓				
1	1520	266	124	66
2	234	1512	432	78
3	117	362	1772	205
4	36	82	179	492



4. Attempt **any one** of the following

- a) i) Explain in brief Phase II study in clinical trials. 4
- ii) Explain the term efficacy and safety of drug. 2
- iii) A patient of high blood pressure is given an intravenous injection of 160 mg. of a beta-blocker. Blood samples are taken for 8 hours and concentration values are recorded. Results are given below. Estimate  $C_{max}$ ,  $T_{max}$ . Also calculate  $AUC_{(0,480)}$ .

<b>Time (min)</b>	30	60	120	150	240	360	480
<b>Concentration (mg/ml)</b>	700	620	400	300	150	50	25

4

- b) i) Write a short note on 'Bioequivalence'. 4
- ii) Explain the term washout period. 2
- iii) Write note on bath tub shaped hazard rate. 4

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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**STATISTICS (Principal) (Paper – VI)**  
**ST-346(B) : Statistical Ecology**  
**(2008 Pattern) (New Course) (Elective – II)**

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) *All questions are compulsory.*  
2) *Figures to the **right** indicate **full** marks.*  
3) *Use of statistical tables is **allowed**.*  
4) *Symbols and abbreviations have their usual meanings.*

1. Attempt **each** of the following :

a) Choose the correct alternative in each of the following :

i) The time at which population gets doubled in exponential model is

A)  $k \cdot \log_e 2$

B)  $2 \cdot \log_e k$

C)  $\frac{\log_e 2}{k}$

D)  $\frac{k}{\log_e 2}$

ii) If  $s$  is the total number of species in a community and  $n$  is sample size then Menhinick's richness index is

A)  $\frac{S}{\sqrt{n-1}}$

B)  $\frac{S-1}{\sqrt{n}}$

C)  $\frac{S}{\sqrt{n}}$

D)  $\frac{S-1}{\sqrt{n-1}}$



iii) In logistic growth model  $\frac{dN_t}{dt}$  is symmetric about

- |                  |                  |
|------------------|------------------|
| A) $k$           | B) $\frac{k}{2}$ |
| C) $\frac{k}{e}$ | D) $\frac{e}{k}$ |

iv) For Gompertz model growth rate  $\frac{dN_t}{dt}$  is maximum at

- |                  |                  |          |
|------------------|------------------|----------|
| A) $\frac{k}{2}$ | B) $\frac{k}{e}$ |          |
| C) $2k$          | D) $\frac{e}{k}$ | (1 each) |

b) State whether **each** of the following statements is **true** or **false** : (1 each)

- |   |   |
|---|---|
| i) Exponential growth model is not sigmoidal.   |   |
| ii) The regular forest is generally a result of competition between the species of nutrients in the soil. |   |
| c) i) Define closed population.   | 1 |
| ii) Define stable equilibrium.  | 1 |
| d) i) Explain in brief what are rare fraction curves ?.   | 1 |
| ii) State the situation where geometric distribution is applicable to model the species abundance.        | 1 |



2. Attempt **any two** of the following :

- a) For logistic growth model find the population size at which growth rate is maximum.
- b) Derive an expression for Gompertz model.
- c) Describe capture recapture method. Derive Peterson's estimator of population size (N) for single recapture in case of closed population. **(5 each)**

3. Attempt **any two** of the following :

- a) In Lesslie matrix model (LMM), state assumptions made, two kinds of parameters, model and its matrix representation.
- b) Describe line transect method for estimating animal population in forest. What is rationale behind using exponential detection function ?
- c) Define Simpson's index for diversity ( $\lambda$ ) Compute  $\lambda$  for the following data :

<b>Species:</b>	1	2	3	4	5	6
<b>No. of individuals</b>	2	5	9	7	3	1

**(5 each)**

4. Attempt **any one** of the following :

- a) i) Describe quadrat sampling method to estimate population density in a forest. Also discuss scope and limitations of this method.
- ii) Discuss states of equilibria in Gompertz model. **(5+5)**



- b) i) What is meant by point to individual nearest neighbour distance in Poisson forest ? Derive maximum likelihood estimator of parameter  $\lambda$  in it. **5**

- ii) Given the following projection matrix  $M = \begin{bmatrix} 0 & 2 \\ 0.5 & 0 \end{bmatrix}$ .

Obtain stable population structure and comment on the growth of the population. **5**

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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**MICROBIOLOGY (Paper – I)**  
**MB-341 : Medical Microbiology – II**  
**(2008 Pattern) (New)**

Time : 2 Hours

Max. Marks : 40

- N.B.:** 1) **All questions are compulsory.**  
2) **All questions carry equal marks.**  
3) **Draw neat labeled diagrams wherever necessary.**

1. Attempt the following :

10

A) Match the following :

**A**

- 1) Malaria
- 2) Rinder pest
- 3) FMD
- 4) Dengue
- 5) Poliomyelitis

**B**

- a) Cattle Plague
- b) Black water fever
- c) Infantile paralysis
- d) Veterinary disease
- e) Breakbone fever

B) Choose the most appropriate answer :

i) \_\_\_\_\_ is an encapsulated yeastlike fungus that causes meningitis.

- |                        |                   |
|------------------------|-------------------|
| a) <i>Aspergillus</i>  | b) <i>Candida</i> |
| c) <i>Cryptococcus</i> | d) None of these  |

ii) Tinea is caused by \_\_\_\_\_

- |                        |                       |
|------------------------|-----------------------|
| a) <i>Cryptococcus</i> | b) <i>Microsporum</i> |
| c) <i>Candida</i>      | d) None of these      |

C) State **True** or **False** :

- i) Nystatin is not absorbed from the gut.
- ii) In Malaria, patient frequently suffers from anaemia.
- iii) Sabin vaccine is given by injection.

P.T.O.



2. Attempt **any two** of the following : **10**
- A) Explain pathogenesis of HIV.
  - B) Explain mode of action of Streptomycin.
  - C) Discuss various modes of transmission and control of Hepatitis B.
3. Attempt **any two** of the following : **10**
- A) Write a note on FMD vaccine.
  - B) Discuss various routes of drug administration.
  - C) Draw and label – Life cycle of *Entamoeba histolytica*.
4. Attempt **any one** of the following : **10**
- A) Describe the mode of action of *Cycloserine* and  $\beta$ -*lactams*. Give the significance of  $\beta$ -*lactamase*.
  - B) Discuss various infections caused by *Candida albicans* and describe its laboratory diagnosis and control.



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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**MICROBIOLOGY (Paper – III)**  
**MB-343 : Metabolism**  
**(2008 Pattern) (New)**

Time : 2 Hours

Max. Marks : 40

- N.B. :** 1) *All questions are compulsory.*  
2) *All questions carry equal marks.*  
3) *Draw neat labeled diagrams wherever necessary.*

1. Attempt the following :

10

a) State **True** or **False** :

- i) ADP glucose serves as an intermediate donor in the starch biosynthesis.
- ii) Entropy of the universe always increases.

b) Enlist the components for activation of amino acids in protein biosynthesis.

c) Choose the correct answer :

The  $\Delta G^\circ$  of phosphoenol pyruvate at pH 7.0 is

- i) – 11.8 K cal/mole
- ii) – 7.5 K cal/mole
- iii) – 14.8 K cal/mole
- iv) – 7.3 K cal/mole

d) Enlist major phases of Calvin cycle.

e) Define :

- i) Substrate level phosphorylation
- ii) Free energy

f) Purple sulfur bacteria use \_\_\_\_\_ as electron donor.

g) Name any four pigments used by bacteria for photosynthesis.

h) Give any two examples of ionophores.

P.T.O.



2. Attempt **any two** of the following : **10**
- a) State First Law of Thermodynamics and explain its applications to biological system with an example.
  - b) Comment on – Transport of sugars by Group Translocation.
  - c) Explain – Elongation of peptide chain in protein biosynthesis.
3. Attempt **any two** of the following : **10**
- a) Explain Carboxylation phase of Calvin cycle.
  - b) Explain the concept of ‘Oxygenic and Anoxygenic Photosynthesis’.
  - c) Diagrammatically represent – Termination of protein synthesis.
4. Attempt **any one** of the following : **10**
- a) What is Glycogen ? Explain how glycogen synthesis occurs.
  - b) What is Oxidative Phosphorylation ? Explain – Chemiosmotic coupling hypothesis for ATP generation.



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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**MICROBIOLOGY (Paper – V)**  
**MB – 345 : Fermentation Technology – II**  
**(2008 Pattern) (New)**

Time : 2 Hours

Max. Marks : 40

- N.B. :** 1) *All questions are compulsory.*  
2) *All questions carry equal marks.*  
3) *Draw neat labeled diagrams wherever necessary.*

1. Attempt the following :

10

a) Define :

- i) International unit of Penicillin
- ii) GMP

b) State **True** or **False** :

*Propionibacterium freudenrichii* is used for acetic acid production.

c) \_\_\_\_\_ yeast is used for top fermenting beer.

d) Write any two applications of *Amylase*.

e) Match the following :

**A**

**B**

- |                  |                                    |
|------------------|------------------------------------|
| i) Beer          | a) Toxoid                          |
| ii) Amylase      | b) Rennet                          |
| iii) Lactic Acid | c) Lager                           |
| iv) Tetanus      | d) Desizing                        |
| v) Cheese        | e) <i>Lactobacillus bulgaricus</i> |

P.T.O.



2. Attempt **any two** of the following : **10**
- 1) Explain in brief the production of glutamic acid.
  - 2) Draw the flow sheet diagram for the production of thuricide.
  - 3) Discuss the post fermentative changes in wine production.
3. Attempt **any two** of the following : **10**
- a) Describe the recovery and applications of *Riboflavin*.
  - b) Draw the flow chart for *Yogurt* preparation.
  - c) What is *Steroid transformation* ? Name any two organisms and write the transformation reactions carried out by them.
4. Attempt **any one** of the following : **10**
- a) Explain the large scale production of *Streptomycin*.
  - b) Describe the production of *Polio vaccine*.

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Seat  
No.

**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**ELECTRONICS SCIENCE (Paper – III)**  
**EL-343 : Power Electronics**  
**(New Course) (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- Notes :** i) **All questions are compulsory.**  
ii) **Neat diagrams must be drawn wherever necessary.**  
iii) **Figures to the right indicate full marks.**

1. Attempt **all** of the following :

- a) Write Schockley equation of diode and give its significance. **1**
- b) What is meant by three phase signal ? **1**
- c) Define turn on & turn off time of power BJT switching characteristics. **1**
- d) What is the role of circuit breaker ? **1**
- e) State regenerative action of thyristor. **2**
- f) What is electric shock ? Why it occurs ? **2**
- g) A step down chopper has a resistive load of  $10\Omega$  and the input voltage is 120V. If voltage drop across switch is 2V and duty cycle is 50% then determine average output voltage and effective input resistance of the chopper. **2**
- h) The charging current to turn on thyristor is 8 mA and capacitance of reverse bias junction in thyristor is 10 PF. Determine  $dv/dt$ . **2**

2. Attempt **any two** of the following :

- a) Explain the working of single phase halfwave rectifier. Obtain an expression for efficiency and form factor. Define the term displacement factor (DF) and harmonic factor (HF). **4**
- b) What is dc chopper ? Explain the concept of class A, class B and class C chopper. **4**
- c) Draw the block diagram of SMPS. Explain its working principle. State its applications. **4**

P.T.O.



3. Attempt **any two** of the following :
- a) Explain the working of single phase dual converter with circuit diagram and wave form. State advantages of it. **4**
  - b) Explain the working of Hall sensor current meter with suitable diagram. **4**
  - c) What is the principle of operation of an inverter ? Draw the circuit diagram of single phase half-bridge inverter and explain its working. **4**
4. Answer **any two** of the following :
- a) What are types of dc drives based on input supply ? Explain the separately excited dc motor with equivalent circuit. Which are the parameters to be varied for speed control of it ? **6**
  - b) What are the differences of AC and DC switches ? Explain single phase AC switch with the help of circuit diagram and waveform. **6**
  - c) i) State the types of power transistors with their I-V ratings. **3**  
ii) What are the purpose of filters used in a rectifier circuits ? Explain DC and AC filter. **3**
-





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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**ELECTRONIC SCIENCE (Paper – VI)**  
**EL – 346 (A) : Instrumentation (Elective – II) (Optional)**  
**(New Course) (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- N.B. :** 1) *All questions are compulsory.*  
2) *Neat diagrams must be drawn wherever necessary.*  
3) *Figures to the right indicate full marks.*

1. Attempt **all** of the following :

- a) State two major categories of classifying instruments. 1
- b) Write any two test signals for measurement systems. 1
- c) Why electrostatic shield is used in instrumentation system ? 1
- d) Write the operating frequency of WWV station of NIST. 1
- e) State at least four characteristics of an ideal op-amp. 2
- f) Name various types of buses used in GPIB system. 2
- g) “Spectrum analyser plots amplitude verses time”. Comment. 2
- h) “Inherent noise is picked up from external sources”. Comment. 2

2. Answer **any two** of the following :

- a) What do you understand by null and detection type of instruments ? Explain null type instrument with suitable example. 4
- b) Explain the working of slotted line detector. 4
- c) What is zero order system ? Explain how potentiometer is a zero order system. 4

P.T.O.



3. Answer **any two** of the following :

- a) Write a note on “specifications and testing of dynamic response”. 4
- b) Explain DIO bus of GPIB system. 4
- c) What are the important parameters of antenna system ? Write expressions for SWR in terms of current, voltage, impedance and power. 4

4. Answer **any two** of the following :

- a) With neat block diagram, explain the method of opposing inputs. Describe how this method can be implemented with suitable example. 6
  - b) What is charge amplifier ? Draw circuit diagram of it and derive expression for its output voltage. 6
  - c) With neat block diagram, explain multichannel DAS with multiplexing after analog to digital conversion. 6
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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**ELECTRONIC SCIENCE (Paper – VI)**  
**EL – 346 (B) : Consumer Electronics (Elective – II) (Optional)**  
**(New Course) (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- N.B. :** 1) **All** questions are **compulsory**.  
2) Figures to the **right** indicate **full** marks.  
3) **Neat** diagram must be drawn **wherever** necessary.

1. Attempt **all** of the following :

- a) What is IF frequency of AM radio receiver ? 1
- b) What is PA system ? 1
- c) State advantage of LCD television. 1
- d) Give advantage of MP4 format. 1
- e) What are types of colour system ? 2
- f) State advantages of blue tooth technology. 2
- g) State two differences between LASER printer and DOT MATRIX printer. 2
- h) What is the role of microcontroller in dish washer ? 2

2. Answer **any two** of the following :

- a) What are different types of loud speakers ? Explain moving coil type speaker in brief. 4
- b) Draw block diagram of DVD play back system and explain its working principle. 4
- c) With neat block diagram explain the working of EPABX system. 4



3. Answer **any two** of the following :

- a) What are the important elements of PA system ? Explain functioning of PA system in brief. 4
- b) Compare plasma TV and LCD TV on basis of principle of operation and performance. 4
- c) What is scanner ? State different types of scanners ? How it is implemented in multifunction unit ? 4

4. Answer **any two** of the following :

- a) What is set top box ? With neat diagram explain its principle of working. 6
- b) Write short note on : 6
  - i) digital camera
  - ii) handycam.
- c) What is the working principle of Xerox machine ? Draw the block diagram of Xerox machine and explain its working. 6

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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**ENVIRONMENTAL SCIENCE**  
**(New Course) (Paper – III)**  
**ENV 343 : Air and Soil Quality**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) *All questions are compulsory.*  
2) *Neat and labeled diagrams must be drawn wherever necessary.*  
3) *Figures to the right indicate full marks.*

1. Attempt the following in 1-2 lines each : 10
- a) What is Contour farming ?
  - b) Define : Meteorology.
  - c) Enlist any functions of nitrogen as nutrient.
  - d) Mention any 2 basic principles of soil conservation.
  - e) State the difference between sampling and monitoring.
  - f) Name any 2 organic chemicals in soil.
  - g) What is meant by soil sickness ?
  - h) Define : Deamination.
  - i) What is La Nina phenomenon ?
  - j) Define : Atmosphere and give its composition.

P.T.O.



2. Write a short note on **(any two)** : **10**
- a) NPK in soil.
  - b) Effects of air pollutants on vegetation and Health of man. **(each 5)**
  - c) Vehicular pollution and its control.
3. Answer **any two** from the following : **10**
- a) Explain in detail determination of Silica and Soluble salts.
  - b) Describe Bhopal Gas Tragedy and comment on present status.
  - c) Explain Photochemical reactions in atmosphere.
4. Attempt **any one** of the following : **10**
- a) Describe Soil structure with reference to types, classes and grades with suitable diagrams.
  - b) Explain the analytical method for sampling and monitoring nitrogen oxide.



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**T.Y. B.Sc. (Semester – IV) Examination, 2012  
ENVIRONMENTAL SCIENCE (Paper – IV)  
ENV 344 : Issues in Environmental Science  
(New Course) (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

**Instructions :** 1) *All questions are compulsory.*

2) *Neat and labeled diagrams must be drawn wherever necessary.*

3) *Figures to the right indicate full marks.*

1. Attempt the following in **1-2** lines **each** : **10**
- What is meant by global warming ?
  - Define soil erosion.
  - What is meant by cost benefit ratio ?
  - Give the full form of SEZ.
  - Give the name of activist who initiated Chipko movement.
  - Define wetland.
  - Give any two examples of eutrophic lakes in India.
  - Enlist any two natural disaster.
  - What is reason behind Fluorosis ?
  - What is meant by rehabilitation ?

P.T.O.



2. Write a short note on **(any two)** : **10**
- a) Consequences of global warming.
  - b) Population and resource depletion.
  - c) Silent valley movement.
3. Answer **any two** from the following : **10**
- a) What are the causes of water crisis ?
  - b) Explain the process of rainwater harvesting.
  - c) Explain urban air quality with reference to vehicular pollution.
4. Attempt **any one** of the following : **10**
- a) Define alkaline and saline soil. Explain different measures used for reclamation.
  - b) Explain various principles of Agenda-21.

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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**ENVIRONMENTAL SCIENCE (Paper – V)**  
**ENV – 345 : Environmental Governance and Equity : EMS and ISO 14000**  
**(2008 Pattern) (New Course)**

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) **All questions are compulsory.**  
2) **Neat and labeled diagrams must be drawn wherever necessary.**  
3) **Figures to the right indicate full marks.**

1. Attempt the following in **1-2** lines each. **10**
- a) Mention any two functions of BIS.
  - b) What is meant by 'Impact' ?
  - c) Write full form for 'CETP'.
  - d) What is meant by 'Ship Recycling' ?
  - e) What is the standard limit of BOD for effluent to be discharged on inland surface water ?
  - f) Write full form for 'EMS'.
  - g) What is the main function of 'Technical Committee' ?
  - h) What is the standard limit of SO<sub>2</sub> (annual average) for residential area ?
  - i) Mention any two benefits associated with renewable energy.
  - j) What is the constitutional provision related with article 48(A) ?

P.T.O.



2. Write a short note on **(any two)** : **10**
- a) Environmental Audit.
  - b) National Environmental Policy.
  - c) Environmental Standards.
3. Answer **any two** from the following : **10**
- a) Explain the role of NGO's in environmental protection.
  - b) What are the objectives of environmental impact assessment ?
  - c) Explain in detail Plan, Do, Check and Act model.
4. Attempt **any one** of the following : **10**
- a) What is generic standard ? Explain in detail guidelines of ISO-14001 for implementation.
  - b) Explain in detail about environmental governance and regulation in India.



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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**BIOTECHNOLOGY (Vocational)**  
**Paper V : Entrepreneurship Development**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) *Neat diagrams must be drawn.*  
2) *All questions carry equal marks.*  
3) *All questions are compulsory.*

1. Answer the following questions in short : **10**
- a) Define entrepreneurship.
  - b) What is proprietorship ?
  - c) Mention any two types of small scale industries.
  - d) Define breakeven point.
  - e) What is venture capital ?
  - f) Define incentive.
  - g) What is VAT ?
  - h) Give role of SICOM.
  - i) What is Joint Stock Company ?
  - j) What is SWOT analysis ?
2. Attempt **any two** of the following : **10**
- a) Comment on key elements of entrepreneur.
  - b) Explain various characteristics of entrepreneur.
  - c) Give salient features of marketing.

P.T.O.



3. Write short notes on **any two** : **10**
- a) Problems of entrepreneur.
  - b) Sources of finance.
  - c) Types of entrepreneur.
4. Attempt **any one** of the following : **10**
- a) Discuss human resource aspects with respect to placement, interpersonal relations, communication skills and soft skills.
  - b) Give role of funding corporations and funding institutes.
-



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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**PHOTOGRAPHY AND AUDIO-VISUAL PRODUCTION (Vocational)**  
**Paper – V : Entrepreneurship Development**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- Instructions:** 1) Question number **one** is **compulsory**.  
2) Answer **any three** questions from the remaining questions.  
3) Provide suitable examples **wherever** necessary.  
4) Figures to the **right** indicate **full** marks.

1. Discuss, by giving suitable examples, how does an entrepreneur help in nation building. 10
  
2. A) What is a sick industry ? What are the causes for the sickness ? How are these overcome ? 5  
  
B) Explain the difference between a small scale industry and a large scale industry. Give suitable examples for support. 5
  
3. A) Compare the role of a professional manager and an entrepreneur. 5  
  
B) What are the administrative traits of an entrepreneur ? 5
  
4. A) What are corporate values ? Why are they important ? 5  
  
B) If you want to start a TV channel how would you prepare ? 5
  
5. Write short notes on **any two** of the following : 10
  - a) Qualities of women entrepreneurs.
  - b) Steve Jobs as an entrepreneur.
  - c) Barriers faced by entrepreneurs.



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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**ELECTRONIC EQUIPMENT & MAINTENANCE (Vocational)**  
**Entrepreneurship Development (Paper – V)**  
**(2008 Pattern) (New Course)**

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) *All questions are compulsory.*  
2) *Figures to the **right** indicate **full** marks.*  
3) *Use of logtable, calculator is **allowed**.*

1. Answer the following : **(3×4=12)**
- a) Answer the following : **(4×1=4)**
- i) Define the term 'entrepreneur'.  
    ii) Define the term 'pricing'.  
    iii) What is meant by stress ?  
    iv) State any two characteristics of an entrepreneur.
- b) Comment on the following : **(2×2=4)**
- i) Shareholders of a joint stock company have limited liability.  
    ii) Shortage of working capital may endanger the business.
- c) Answer the following : **(2×2=4)**
- i) State different modes of employment in a business organisation.  
    ii) State different soft skills.
2. Answer **any two** of the following : **(2×4=8)**
- a) Explain different types of entrepreneur.  
b) Discuss advantages and limitations of partnership.  
c) Give salient features of Factories Act.
3. Answer **any two** of the following : **(2×4=8)**
- a) Discuss how to obtain ideas for starting a new business.  
b) Discuss the role of M.S.F.C in entrepreneurship development.  
c) Elaborate the statement 'placement of proper person for a job'.

P.T.O.



4. Answer **any two** of the following : **(2×6=12)**

- a) Explain the terms 'market segmentation' and 'marketing channels'.
- b) Give the meaning of technical and economic feasibility of a project.
- c) What is SWOT analysis ? How does it help the businessman ?

OR

4. Write short notes on the following : **(3×4=12)**

- a) Market survey as a tool.
  - b) Structure of project report.
  - c) Co-operative organisation.
-



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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**COMPUTER HARDWARE AND NETWORK ADMINISTRATION**  
**(Vocational)**  
**Paper – V : Entrepreneurship Development**  
**(New Course) (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

**Instructions :** 1) **All questions are compulsory.**  
2) **Figures to the right indicate full marks.**

1. a) Attempt **all** of the following : **(10×1=10)**
- i) What is MIDC ?
  - ii) Who is an Entrepreneurship ?
  - iii) Explain the term 'Break Even Point' ?
  - iv) Why do we go to Maharashtra State Electricity Board ?
  - v) Entrepreneurship Development Program of India is carried out under which Ministry ?
  - vi) Which tax do we pay on our excess income ?
  - vii) What is a meaning of SIDBI ?
  - viii) Give any one characteristic of an Entrepreneur.
  - ix) What is a 'Liability' ?
  - x) Is 'Place' one of the important factors of Marketing Mix.
2. Attempt **any two** of the following : **(2×5=10)**
- a) What are the different types of Entrepreneurs ?
  - b) Explain the importance of various funding agencies.
  - c) What is the role of Human Resource Department in Entrepreneurship Development Program of India ?

P.T.O.





3. Attempt **any two** of the following : **(2×5=10)**

- a) Explain the main four elements of Marketing Mix.
- b) What are the different forms of Business Organizations ?
- c) What are the key elements of Entrepreneurship Development ?

4. Attempt **any one** of the following : **(1×10=10)**

- a) What are the De-merits of a Co-operative Organization ? What are the merits of a Partnership Firm ?

OR

b) Explain the application of taxes given below :

- 1) VAT
- 2) Service Tax
- 3) Excise Rules
- 4) Income Tax
- 5) Patent Rules.

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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**INDUSTRIAL CHEMISTRY (Vocational)**  
**Paper – VI : Inorganic and Organic Based Industries – II**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- N.B. :** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*  
3) *Neat diagrams must be drawn wherever necessary.*

1. Answer the following questions. 10
- a) What are cationic surfactants ? Give one example.
  - b) What is medicated soap ?
  - c) What are antiinflammatory agents ?
  - d) Define bactericidal agent.
  - e) Draw the structure of p-acetamol.
  - f) Define the term 'Chromogen'.
  - g) What is 'nitromusk' ? Give an example.
  - h) Give classification of fibre.
  - i) Define the term 'degree of polymerisation.
  - j) Give significance of  $\bar{M}_n$  and  $\bar{M}_w$ .
2. A) Attempt **any two** of the following : 6
- a) Give synthesis of methyl orange.
  - b) Explain the process of prickling and expression.
  - c) Explain the advantages of detergents.
- B) Attempt **any two** of the following : 4
- a) Explain the terms auxochrome and chromophore.
  - b) What are surfactants ? Give examples.
  - c) Distinguish between soap and detergents (3 points).

P.T.O.



3. Write notes on **any two** of the following : 10
- a) Synthesis of crystal violet and alizarine.
  - b) Pressure sensitive and chemically reactive adhesives.
  - c) Shampoos.
4. A) Define the term drug. Explain qualities of good drug. Give synthesis of sulphanimide. 6
- OR
- A) Explain the 'OHO Witts' theory of colours. Give synthesis of Rosaniline with its application. 6
- B) Attempt **any one** of the following : 4
- a) Give manufacturing of Aspirin with flow sheet diagram.
  - b) Write a note on raw materials required for manufacture of detergents.



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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**ELECTRONIC EQUIPMENT & MAINTENANCE (Vocational)**  
**Medical Instrumentation (Paper – VI)**  
**(2008 Pattern) (New Course)**

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) *All questions are compulsory.*  
2) *Figures to the **right** indicate **full** marks.*  
3) *Use of log tables, calculators is **allowed**.*

1. a) Answer the following : **(4×1=4)**  
i) What is the typical potential of a polarised cell ?  
ii) What is CNS ?  
iii) State the precaution for UV recorders.  
iv) What is hematocrit ?
- b) Answer the following : **(2×2=4)**  
i) What are : a) synapse, b) neuro muscular junction ?  
ii) Name two major nodal points in heart.
- c) Answer the following : **(2×2=4)**  
i) What do you mean by internal electrodes ?  
ii) State any two types of amplifiers used in medical instrumentation.
2. Answer **any two** : **(2×4=8)**  
i) Explain electrode arrays.  
ii) Discuss the filter photometer.  
iii) Explain principle of ion selective electrode and discuss PO<sub>2</sub> electrode.
3. Answer **any two** : **(2×4=8)**  
i) Discuss practical hints in using biopotential electrodes.  
ii) Discuss metalplate body surface recording electrodes.  
iii) Explain in brief macroshock hazards.

P.T.O.



4. Answer **any two** : **(2×6=12)**

- i) Explain the basic plan in CNS.
- ii) What is homogram ? Explain conductivity based blood cell counter.
- iii) Discuss the sources of external noise in low level recording circuit.

OR

4. Answer the following : **(3×4=12)**

- i) Discuss epilepsy.
  - ii) Discuss with block diagram, basic recording system.
  - iii) Explain main considerations for bioelectric amplifier.
-



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No.

**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**INDUSTRIAL MICROBIOLOGY (Vocational) (Paper – VI)**  
**IND-MIC-346 : Entrepreneurship Development**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- N.B.:** 1) *All questions are compulsory.*  
2) *All questions carry equal marks.*  
3) *Draw neat labeled diagrams wherever necessary.*  
4) *Figures to the right indicate full marks.*

1. Answer the following :

10

Choose the correct option :

i) Costs that vary directly with the level of production are referred to as \_\_\_\_\_

- a) fixed costs                      b) variable costs  
c) target costs                      d) total costs

ii) \_\_\_\_\_ involves activities undertaken to create, maintain or change attitudes towards particular cities, states and regions. India advertises “Incredible India”.

- a) Idea marketing                      b) Place marketing  
c) Social marketing                      d) Interactive marketing

iii) Characteristics of entrepreneurs include all of the following EXCEPT

- a) Tolerance for ambiguity              b) Flexibility  
c) Skill at organizing                      d) Low degree of commitment

iv) ‘W’ in SWOT Analysis stands for

- a) Worthiness                              b) Weaknesses  
c) Wholesomeness                      d) Workable

P.T.O.



State **true** or **false** :

- v) The concept of market segmentation is based on the assumption that the markets are homogeneous.
- vi) Market potential is assessed by undertaking marketing research.
- vii) Training is optional to impart the required job knowledge and skill to newly recruited employees.

Fill in the blanks :

- viii) If as on 31-3-2011, the current assets are Rs. 35,000 and current liabilities are Rs. 20,000, then the working capital is Rs. \_\_\_\_\_
- ix) The balance sheet consists of three main categories i.e. the assets, \_\_\_\_\_ and owners' equity.
- x) The minimum number of persons required to form a public company is \_\_\_\_\_

2. Attempt **any two** of the following :

**10**

- a) Explain the strategies for growth of an organization.
- b) Name and explain any 3 forms of business ownership or organizations. Provide two pros and two cons for any one of the types.
- c) Write a note on "Danhof's Classifications of Entrepreneurs".

3. Attempt **any two** of the following :

**10**

- a) Define any five terms related to communication.
- b) Enumerate any five characteristics of SSI.
- c) Given the following figures :

<b>Particulars</b>	<b>Amount (Rs.)</b>
Fixed cost	15,000
Selling price per unit	8
Variable cost per unit	5



Show the impact of the following changes on breakeven point :

- i) Fixed cost increase by Rs. 6,000.
- ii) Decrease in fixed costs by Rs. 3,000.
- iii) 20% increase in variable cost.
- iv) Fixed cost increase by 20% and variable costs decreased by 20%

4. Attempt **any one** of the following :

**10**

- a) “Recruitment refers to the attempt of getting interested applicants and providing a pool of prospective employees so that the management can select the right person for the right job from this pool”. Explain the various sources of recruitment.
- b) “Choice of appropriate channel of distribution is a very important marketing decision, which affects the performance of an organization”. Explain the factors affecting the choice.





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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**MATHEMATICS (Paper – III)**  
**MT – 333 : Problem Course Based on MT – 331 and MT – 332**  
**(2008 Pattern) (New Course)**

Time : 2 Hours

Max. Marks : 40

- N.B. :** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*  
3) *Answers to the two Sections should be written in separate answer books.*  
4) *Tie answer books of both Sections together.*

SECTION – I

**(Set Theory and Logic)**

1. A) Attempt **any three** of the following : **6**
- i) Give the example of a relation which is reflexive, symmetric but not transitive.
  - ii) Show that  $[0 \ 1]$  is similar to  $(0 \ 1]$ .
  - iii) Write the negation of  $(\exists x)(\forall y)P(x, y)$ .
  - iv) Prove that  $\sim(p \vee q) \equiv \sim p \wedge \sim q$ .
- B) Attempt **any one** of the following : **4**
- i) Prove that, if A, B, C are sets then  $(A \cap B) \times C = (A \times C) \cap (B \times C)$
  - ii) If  $F : \mathbb{R}^+ \rightarrow \mathbb{R}^+$ , where  $f(x) = \int_0^x \frac{dt}{t}$  then show that f is one-one and onto function.

P.T.O.



2. Attempt **any two** of the following :

10

i) Prove that for all positive integer

$$1 + 2 + 3 + \dots + n = \frac{n(n+1)}{2}$$

ii) Show that  $\sim (\forall x)[P(x) \rightarrow Q(x)]$  and  $(\exists x)[P(x) \wedge \sim Q(x)]$  are logically equivalent.

iii) If  $f$  is one-one and onto then prove that  $F(A \cap B) = F(A) \cap F(B)$ .

### SECTION – II

### (Real Analysis)

3. A) Attempt **any three** of the following :

6

i) Find the limit superior and limit inferior of the sequence,  $\left\{ \sin \frac{(n\pi)}{4} \right\}_{n=1}^{\infty}$

ii) Does the series  $\sum_{n=0}^{\infty} \frac{n^4}{n!}$  converges ?

iii) Give an example of a function which is bounded on  $[a, b]$  but not Riemann integrable on  $[a, b]$ .

iv) Find the sum of the series  $\sum_{n=0}^{\infty} x(1-x)^n$ .

B) Attempt **any one** of the following :

4

i) Using the Cauchy's condensation test show that  $\sum_{n=1}^{\infty} \frac{1}{n^2}$  is convergent.

ii) Evaluate  $\lim_{n \rightarrow \infty} \frac{1}{n} \left[ e^{\frac{3}{n}} + e^{\frac{6}{n}} + \dots + e^{\frac{3n}{n}} \right]$ .



4. Attempt **any two** of the following :

10

i) If  $\{f_n\}_{n=1}^{\infty}$  and  $\{g_n\}_{n=1}^{\infty}$  converges uniformly on E then prove that  $\{F_n + g_n\}_{n=1}^{\infty}$  converges uniformly on E.

ii) Show that the series  $\sum_{n=1}^{\infty} e^{-nx}$  is uniformly convergent on  $[0, 10]$ .

iii) If  $f(x) = x$  and for  $n \in \mathbb{I}$ , if  $\sigma_n = \left\{0, \frac{1}{n}, \frac{2}{n} \dots \frac{n}{n}\right\}$  in a subdivision of  $[a, b]$

then compute  $\lim_{n \rightarrow \infty} L[f, \sigma_n]$ .







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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**MATHEMATICS (Paper – IV)**  
**MT – 334 : Group Theory**  
**(2008 Pattern) (New Course)**

Time : 2 Hours

Max. Marks : 40

**N.B. :** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*

1. Attempt **any five** of the following : **10**

i) In  $S_3$ , give an example of two elements  $x, y$  such that  $(x.y)^2 \neq x^2.y^2$ .

ii) Show that  $(\mathbb{Z}, +)$  and  $(3\mathbb{Z}, +)$  are isomorphic groups.

iii) Mark the statement **true** or **false** with justification :

If every subgroup of  $G$  is normal then  $G$  is abelian.

iv) Find orbits of the following permutation

$$\begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 2 & 1 & 4 & 5 & 6 & 3 \end{pmatrix}$$

v) Let  $A$  be an infinite set and

$$H = \{\sigma \in S_A / \sigma \text{ moves exactly 50 elements of } A\}$$

Is  $H$ , a subgroup of  $S_A$ ? Where  $S_A$  is the set of all permutations on  $A$ .

vi) Is  $(\mathbb{Z}^*, \cdot)$  a group? Justify.

vii) Give example to show that the product of two subgroups need not be a subgroup.

2. Attempt **any two** of the following : **10**

i) Let  $G$  be a group then for  $a \in G$ , show that  $0(a) = 0(a^{-1})$ .

ii) If  $H, K$  are subgroups of  $G$  then show that  $H \cap K$  is a subgroup of  $G$ . Is  $H \cup K$  always a subgroup of  $G$ ? Justify.

iii) If  $G$  is a finite group, then show that there exists a positive integer  $N$  such that  $a^N = e$  for all  $a \in G$ .

P.T.O.



3. Attempt **any two** of the following : 10
- i) If  $N, M$  are normal subgroups of  $G$ . Prove that  $NM$  is also a normal subgroup of  $G$ .
- ii) Let  $G$  be any group,  $g$  a fixed element in  $G$ . Define  $\phi : G \rightarrow G$  by  $\phi(x) = gxg^{-1}$ . Prove that  $\phi$  is an isomorphism of  $G$  onto  $G$ .
- iii) Let  $G$  be the set of all  $2 \times 2$  matrices  $\begin{pmatrix} a & b \\ 0 & d \end{pmatrix}$  where  $ad \neq 0$  under matrix multiplication. Let  $N = \left\{ \begin{pmatrix} 1 & b \\ 0 & 1 \end{pmatrix} \right\}$ . Prove that  $N$  is a normal subgroup of  $G$  where  $a, b, d \in \mathbb{R}$ .
4. Attempt **any one** of the following : 10
- i) a) If  $G$  is a group in which  $(a.b)^i = a^i . b^i$  for three consecutive integers  $i$  for all  $a, b \in G$ . Show that  $G$  is abelian. 7
- b) If  $G$  is a group such that  $(a . b)^2 = a^2 . b^2$  for all  $a, b \in G$ , show that  $G$  is abelian. 3
- ii) a) If  $H$  and  $K$  are subgroups of  $G$  then show that  $HK$  is a subgroup of  $G$  if and only if  $HK = KH$ . 7
- b) If  $\sigma = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 3 & 1 & 4 & 5 & 6 & 2 \end{pmatrix}$  then find  $\sigma^{100}$ . 3



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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**MATHEMATICS (Paper – VI)**  
**MT – 336 : Problem Course Based on MT – 334 and MT – 335**  
**(2008 Pattern) (New Course)**

Time : 2 Hours

Max. Marks : 40

- N.B. :** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*  
3) *Answers to the two Sections should be written in separate answer books.*  
4) *Tie answer books of both Sections together.*

SECTION – I

**(Group Theory)**

1. A) Attempt **any three** of the following : **6**

- i) State whether true or false with justification.  
Group of order 6 is always abelian.
- ii) Let  $G$  be group of real numbers under addition and  $\phi : G \rightarrow G$  is given by  
 $\phi(x) = x + 1 \quad \forall x \in G$ . Is  $\phi$  a homomorphism ?
- iii) If  $\sigma = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 3 & 1 & 4 & 5 & 6 & 2 \end{pmatrix}$ ,  $\tau = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 2 & 4 & 1 & 3 & 6 & 5 \end{pmatrix}$  be permutation  $S_6$ .  
Then find  $\sigma \cdot \tau^{-1}$ .
- iv) Let  $G = (z, +)$  and  $H = 4z$ . Find all distinct left cosets of  $H$  in  $G$ .

B) Attempt **any one** of the following : **4**

- i) Let  $G$  be the set of all real  $2 \times 2$  matrices  $\begin{pmatrix} a & 0 \\ 0 & a^{-1} \end{pmatrix}$  where  $a \neq 0$ . Prove that  
 $G$  is an abelian group under matrix multiplication.

P.T.O.



ii) Let  $G$  be group of non zero complex numbers.

$G = \{a + ib \mid a, b \in \mathbb{R}, a \neq 0, b \neq 0\}$  under multiplication and Let

$H = \{a + ib \in G \mid a^2 + b^2 = 1\}$  then prove that  $H$  is subgroup of  $G$ .

2. Attempt **any two** of the following :

10

i) If  $\mu = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 \\ 3 & 6 & 4 & 1 & 8 & 2 & 5 & 7 \end{pmatrix}$  be permutation in  $S_8$  then find  $\sigma^{-1}$ ,  $O(\sigma)$

and determine whether  $\sigma$  is even or odd.

ii) Suppose that  $N$  and  $M$  are two normal subgroups of group  $G$  and that

$N \cap M = \{e\}$  then show that for any  $n \in N$  and  $m \in M$ ,  $nm = mn$ .

iii) Let  $G$  be group and  $a \in G$  be unique element of order 2 then show that  $ax = xa$

for all  $x \in G$ .

## SECTION – II

### (Ordinary Differential Equations)

3. A) Attempt **any three** of the following :

6

i) Find the family of orthogonal trajectories to the curves  $y = cx^2$ .

ii) Find the general solution of differential equation  $\frac{d^3y}{dx^3} - 3\frac{d^2y}{dx^2} + 2\frac{dy}{dx} = 0$ .

iii) Show that  $x = 2e^{4t}$ ,  $y = 3e^{4t}$  and  $x = e^{-t}$ ,  $y = -e^{-t}$  are solutions of the

homogeneous system  $\frac{dx}{dt} = x + 2y$ ,  $\frac{dy}{dt} = 3x + 2y$ .

iv) Find the integrating factor of the differential equation  $y dx + (2x - ye^y) dy = 0$ .





B) Attempt **any one** of the following :

4

i) Solve the linear differential equation  $x \frac{dy}{dx} + y = x^4$  .

ii) Find the solution of initial value problem  $y'' + 6y' + 9y = 0$  , with  $y(0) = 0$ ,  $y'(0) = 5$  .

4. Attempt **any two** of the following :

10

i) Solve the differential equation  $\frac{d^2y}{dx^2} - \frac{dy}{dx} - 2y = 4x^2$  .

ii) Solve the system of differential equations  $\frac{dx}{dt} = x + y$ ,  $\frac{dy}{dt} = 4x - 2y$  .

iii) Find the power series solution of the differential equation  $y' + y = 0$  .

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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**MATHEMATICS (Paper – VII)**  
**MT – 337 : Elective (A) : Operations Research**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

**N.B.:** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*

1. Attempt **any five** of the following : **10**

i) Why we cannot leave out of feasible region by taking minimum positive ratio ?  
Explain.

ii) Show that following L.P.P. has infinitely many optimal solutions :

$$\text{Max : } Z = 10x_1 + 6x_2$$

Subject to

$$5x_1 + 3x_2 \leq 30$$

$$x_1 + 2x_2 \leq 18$$

$$x_1, x_2 \geq 0$$

iii) Identify the direction of increase in Z of the function  $\text{max } Z = x_1 - 2x_2$ .

iv) What is the purpose of a dummy row or column in an assignment problem ?

v) Write general mathematical model of transportation problem in terms of L.P.P.

vi) Write dual of following L.P.P.

$$\text{Max : } Z = x_1 - 2x_2 + 3x_3$$

Subject to

$$-2x_1 + x_2 + 3x_3 = 2$$

$$2x_1 + 3x_2 + 4x_3 = 1$$

$$x_1, x_2, x_3 \geq 0$$

P.T.O.



vii) What are redundant constraints in following problem ?

$$\text{Max } Z = 6x_1 + 12x_2$$

Subject to

$$x_1 + 2x_2 \leq 10$$

$$2x_1 - 5x_2 \leq 20$$

$$x_1 + x_2 \leq 15$$

$$x_1, x_2 \geq 0$$

2. Attempt **any two** of the following :

10

i) On October 1, a company received a contract to supply 6,000 units of specialized product. The terms of contract requires that 1,000 units be shipped in October; 3,000 units in November and 2,000 units in December. The company can manufacture 1,500 units per month on regular time and 750 units per month on over time. The manufacturing cost per item produced during regular time is Rs.3 and the cost per item produced during over time is Rs. 5. The monthly storage cost is Re.1. Formulate this problem as linear programming problem to minimize total cost.

ii) Use graphical method to show that given LPP has unbounded solution

$$\text{Max : } Z = 3x_1 + 4x_2$$

Subject to

$$x_1 - x_2 = -1$$

$$-x_1 + x_2 \geq 0$$

$$x_1, x_2 \geq 0$$

Justify the same by simplex algorithm.

iii) Use two-phase simplex method to solve the following LPP

$$\text{Minimize : } Z = x_1 + x_2$$

Subject to

$$2x_1 + x_2 \geq 4$$

$$x_1 + 7x_2 \geq 7$$

$$x_1, x_2 \geq 0$$



3. Attempt **any two** of the following :

10

i) A Solicitor's firm employs typists on hourly piece-rate basis for their daily work. There are five typists and their charges and speed are different. According to an earlier understanding only one job is given to one typist and the typist is paid full hour even if he works for a fraction of an hour. Find least cost assignment for the following data :

Typist	A	B	C	D	E
Rate per hour	5	6	3	4	4
No. of pages typed per hour	12	14	8	10	11

Job	P	Q	R	S	T
No. of Pages	199	175	145	298	178

ii) Find initial basic feasible solution of the following transportation problem by VAM. The entries in the matrix indicate the cost in rupees of transporting a unit from a particular source to a particular destination.

Source	Destination				Supply
	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	
S <sub>1</sub>	15	18	22	16	30
S <sub>2</sub>	15	19	20	14	40
S <sub>3</sub>	13	16	23	17	30
Demand	20	20	25	35	



- iii) A company has three plants and four warehouses the supply and demand in units and corresponding costs are given. The table below has been from the solution procedure of a transportation problem.

		Warehouses				Supply
		I	II	III	IV	
Plants	A	5	10	4 (10)	5	10
	B	6 (20)	8	7	2 (5)	25
	C	4 (5)	2 (10)	5 (5)	7	20
Demand		25	10	15	5	55

Answer the following questions, giving brief reasons :

- Is this solution feasible ?
- Is this solution degenerate ?
- Is this solution optimum ?
- Does this problem have more than one optimum solution ? If so, show all of them.
- If the cost for the route B – III is reduced from 7 Rs. to 6 Rs. per unit. Then what about optimality of given solution ?

4. Attempt **any one** of the following :

10

- i) Solve the dual of the following problem. Then find optimal solution of the primal from the solution of the dual.

$$\text{Min } Z = x_1 + x_2$$

Subject to

$$x_1 + 2x_2 \geq 2$$

$$x_1 + 7x_2 \geq 7$$

$$x_1, x_2 \geq 0$$

- ii) Solve following LPP and discuss the effect of change in the availability of resources from  $[3, 9]^t$  to  $[9, 6]^t$ .

Consider L.P.P.

$$\text{Max } Z = 4x_1 + 6x_2 + 2x_3$$

Subject to

$$x_1 + x_2 + x_3 \leq 3$$

$$x_1 + 4x_2 + 7x_3 \leq 9$$

$$x_1, x_2, x_3 \geq 0$$



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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**MATHEMATICS (Paper – VII) (Ele. – I)**  
**MT – 337 (B) : Lattice Theory**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

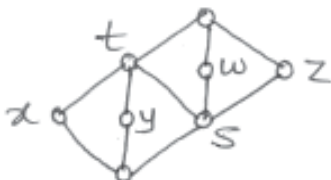
**N.B. :** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*

1. Attempt **any five** of the following : **10**

- i) Write all ideals of a lattice of positive factors of 10 under divisibility.
- ii) In a Boolean algebra  $B$ , show that  $(a')' = a \quad \forall a \in B$ .
- iii) Draw two diagrams of ordered sets with three elements.
- iv) Give example of a modular lattice.
- v) Draw the circuit for the following Boolean function  $a \vee [b \wedge (c \vee d)]$ .
- vi) Show that every finite lattice is complete.
- vii) Write the ascending chain condition.

2. Attempt **any two** of the following : **10**

- i) State and prove Knaster – Tarski fix point theorem.
- ii) Check whether the following lattice is modular or not



- iii) Draw the lattice of subgroups of the group  $\mathbb{Z}_2 \times \mathbb{Z}_4$ .

P.T.O.



3. Attempt **any two** of the following : 10
- i) Let  $L$  be a lattice satisfying descending chain condition (DCC). Suppose  $a, b \in L$  and  $a \not\leq b$ . Show that there exists a join-irreducible element  $x$  such that  $x \leq a$  and  $x \not\leq b$ .
  - ii) Show that every chain is a distributive lattice.
  - iii) Write the disjunctive normal form of  $((P_1 \vee P_2) \wedge (P_1^1 \vee P_3))!$
4. Attempt **any one** of the following : 10
- i) a) If  $M$  and  $N$  are modular lattices, then show that  $M \times N$  is modular.  
b) Write all dual ideals (filter) of the lattice of positive factors of 30 under divisibility.
  - ii) a) In a Boolean algebra  $B$ , prove that  $(a \vee b)' = a' \wedge b'$  for all  $a, b \in B$ .  
b) Show that non-empty intersection of two sublattices is a sublattice. Show that the union of two sublattices may not be a sublattice.
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**T.Y.B.Sc. (Semester – III) Examination, 2012**  
**MATHEMATICS (Paper – VII)**  
**MT-337 : Elective – C : C-Programming – I**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

**N.B. :** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*

1. Attempt **any five** of the following : **10**
- i) Determine which of the following are valid identifiers ? Justify.
    - a) My name
    - b) One + two
  - ii) Find the value of the following expression :  
$$20/7 + 20\%7 + 20*2/3$$
  - iii) Explain the meaning of each of the following function declarations :  
int func 1 (int a, int b);  
float func 2(int a, float x);
  - iv) Explain the meaning of the following declaration :  
int a[2] = {7, 13};
  - v) Write a 'for loop' to calculate the sum :  
$$0 + 1 + 2 + \dots + 30$$
  - vi) State any two advantages of functions.
  - vii) Write a note on conditional operator.

P.T.O.



2. Attempt **any two** of the following : 10
- i) Write a note on switch statement.
  - ii) Write a note on do-while loop.
  - iii) Write a C program to find g.c.d. of two integers.
3. Attempt **any two** of the following : 10
- i) Write a C program to find the sum of n numbers, store n numbers in an array.
  - ii) Explain the use of printf() function.
  - iii) Write a note on two dimensional arrays.
4. Attempt **any one** of the following : 10
- i) a) Write a short note on functions in C.  
b) Write a C program to find the transpose of a square matrix.
  - ii) a) Write a C program to find the reverse of a string.  
b) Write a short note on operators in C.



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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**MATHEMATICS (Paper – VII)**  
**MT 337 Elective F : Number Theory**  
**(New Course) (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

**N.B. :** i) *All questions are compulsory.*  
ii) *Figures to the right indicates full marks.*

1. Attempt **any five** of the following : **10**

- i) If  $(a, m) = 1$  and  $(b, m) = 1$  then show that  $(ab, m) = 1$ .
- ii) If  $(a, b) = P$ , a prime, what are possible values of  $(a^2, b)$  ? of  $(a^2, b^3)$  ?
- iii) Write a single congruence that is equivalent to the pair of congruences  $x \equiv 1 \pmod{4}$ ,  $x \equiv 2 \pmod{3}$ .
- iv) What is the last digit in the ordinary decimal representation of  $3^{400}$  ? Justify.
- v) Prove that  $[x + m] = [x] + m$  if  $m$  is an integer.
- vi) Find the smallest integer  $x$  for which  $d(x) = 6$ .
- vii) Find two pythagorean triples whose terms are in arithmetic progression.

2. Attempt **any two** of the following : **10**

- i) Prove that  $ax \equiv ay \pmod{m}$  if and only if  $x \equiv y \pmod{\frac{m}{(a, m)}}$
- ii) Prove that the number of primes is infinite and there are arbitrary large in the series of primes.
- iii) Show that there is no  $x$  for which  $x \equiv 29 \pmod{52}$  and  $x \equiv 19 \pmod{72}$ .

P.T.O.



3. Attempt **any two** of the following : 10

i) Let  $f(n)$  be a multiplicative function and  $F(n) = \sum_{d|n} f(d)$ . Prove that  $F(n)$  is multiplicative.

ii) Find all the integers that gives the remainder 1, 2, 3 when divided by 3, 4, 5 respectively.

iii) Let  $p$  be odd prime and  $(a, p) = 1$ . Then prove that  $\left(\frac{a}{p}\right) \equiv a^{\frac{p-1}{2}} \pmod{p}$ .

4. Attempt **any one** of the following : 10

i) a) State and prove Wilson's theorem. 6

b) Find all solutions of  $10x - 7y = 17$ . 4

ii) a) If  $x, y, z$  is a primitive Pythagorean triple than prove that one of the integer  $x$  or  $y$  is even while other is odd.

b) Show that  $7 \mid (3^{2n+1} + 2^{n+2})$  for all  $n$ .

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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**PHYSICS (Paper – II)**  
**PH-332 : Classical Electrodynamics**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- N.B. :** i) *All questions are compulsory.*  
ii) *Figures to the **right** indicate **full** marks.*  
iii) *Use of log-table and calculator is **allowed**.*

1. Attempt **all** of the following (**one each**) : **10**
- a) State limitations of Coulomb's law.
  - b) State differential form of Gauss' law.
  - c) Define line charge density and state its S.I. unit.
  - d) Define electric susceptibility.
  - e) Define retentivity and coercivity.
  - f) State Poynting theorem.
  - g) What do you mean by displacement current ?
  - h) State Maxwell's equations for good conductor.
  - i) What do you mean by Gaussian surface ?
  - j) State relation between  $\vec{D}$ ,  $\vec{E}$  &  $\vec{P}$ .
2. Attempt **any two** of the following (**5 each**) : **10**
- a) Show that  $\vec{E} \cdot \frac{\partial \vec{D}}{\partial t}$  &  $\vec{H} \cdot \frac{\partial \vec{B}}{\partial t}$  respectively denote rate of change of energy density stored in electric and magnetic fields.
  - b) Explain ferromagnetism on the basic of domain theory.
  - c) A sphere of radius  $a$  is centered at origin and has uniform surface charge density  $\sigma_s$ . Using Gauss' law find  $\vec{D}$  inside and outside the hollow sphere.

P.T.O.



3. Attempt **any two** of the following (5 each) : 10
- a) Electric field intensity in free space is  $E = E_0 (\sin Bz)(\cos wt)\hat{a}_z$  . Determine the corresponding charge density.
  - b) State Ampere's circuital law and prove that  $\vec{\nabla} \times \vec{B} = \mu_0 \vec{J}$ .
  - c) Find the work required to put four charges + q, - q, + q & - q together if place at corners A, B, C, D of square of each side 1m if  $q = 1 \times 10^{-6} \text{C}$ .
4. A) Attempt **any one** of the following : 8
- a) Outline basic principle of electrical images. Derive expression for surface charge density of induced charges due to point charge near grounded conducting plane.
  - b) Starting with Faraday's law of electromagnetic induction, obtain the corresponding Maxwell's equations of electromagnetic field. and give physical significance of each.
- B) Attempt **any one** of the following : 2
- a) The hysteresis loop for specimen of 16000 gm is equivalent to 3000 erg/cm<sup>3</sup>. Find the loss of energy per hour at frequency of 50 cycle/second, if density of specimen is 10 gm/cm<sup>3</sup>.
  - b) Find electric field intensity due to point charge 1  $\mu\text{C}$  at a distance 3 meter from it in air.

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**T.Y.B.Sc. (Semester – III) Examination, 2012**  
**PHYSICS (Paper – III) (2008 Pattern) (New)**  
**PH – 333 : Classical Mechanics**

Time : 2 Hours

Max. Marks : 40

- N.B :** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*  
3) *Use of log tables and calculators is allowed.*

1. Attempt **all** of the following. (1 mark each) **10**
- a) Find the angle of projection at which range of the projectile is maximum.
  - b) State Kepler's second law of planetary motion.
  - c) What is geosynchronous orbit of a satellite ?
  - d) State the principle of conservation of angular momentum of a particle.
  - e) Define the term 'impact parameter'.
  - f) What do you mean by inelastic scattering ?
  - g) State the principle of virtual work.
  - h) Give any two limitations of Newtonian formulation.
  - i) State the principle of Galilean invariance.
  - j) What are cyclic co-ordinates ?
2. Attempt **any two** of the following :
- a) Discuss the motion of a charged particle in a constant magnetic field. Hence show that path of a charged particle moving with a uniform velocity in constant magnetic field is a circle. **5**
  - b) What are generalized co-ordinates ? Explain transformation equations. **5**
  - c) What is coriolis force ? Explain the effect of coriolis force on cyclone formation. **5**

P.T.O.



3. Solve **any two** of the following :

- a) Calculate the deviation of a freely falling body from a height of 100 meters at latitude  $40^\circ$  N due to coriolis force. 5
- b) A rocket engine of mass  $30 \times 10^4$  kg having fuel of mass  $20 \times 10^4$  kg ejects exhaust gases with velocity of 3000 m/s at the rate of  $10^4$  kg/s. Calculate the maximum vertical velocity attained by the rocket. 5
- c) Find the degrees of freedom for following systems.
- i) Simple pendulum
- ii) Rigid body. 5

4. A) Attempt **any one** of the following :

- a) What is central force ? Use central force motion to obtain the equation of orbit in the form

$$\theta = \int \frac{\left(\frac{L}{r^2}\right) dr}{\sqrt{2m(E - V - \left(\frac{L^2}{2mr^2}\right))}} + \theta_0 \quad 8$$

- b) What is elastic scattering ? Obtain the relation between position vectors and velocities in LAB and CM Frame. 8

B) Attempt **any one** of the following :

- a) Draw a graph of effective potential energy against position vector  $r$ . 2
- b) A charged particle having charge  $2 \mu\text{C}$  enters the magnetic field of induction  $4 \times 10^{-4}$  T with velocity  $3 \times 10^4$  m/s with an angle  $30^\circ$  with the field. Find the force acting on the particle. 2





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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**PHYSICS (Paper – IV) (2008 Pattern)**  
**PH-334 : Atomic and Molecular Physics**

Time : 2 Hours

Max. Marks : 40

- N.B. :** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*  
3) *Use of log tables and calculator is allowed.*

1. Attempt **all** of the following (**One mark each**) : **10**
- a) State first postulate of Bohr's theory.
  - b) What are molecular spectra ?
  - c) Give electronic configuration of sodium.
  - d) State any two characteristics of Raman lines.
  - e) What is fine structure of spectral lines ?
  - f) What are anti-stroke's lines ?
  - g) What is the multiplicity of state ?
  - h) What is anomalous Zeeman effect ?
  - i) Find L, S and J value for the state  ${}^2P_{3/2}$
  - j) Write the electronic configuration of neon atom ( $z = 10$ )
2. Attempt **any two** :
- a) Describe rotation-vibration spectra of a diatomic molecule. Explain its P<sub>-</sub> and R<sub>-</sub> branches. **5**
  - b) Mention different F factors for all possible interaction energies for two valence electron system. **5**
  - c) State Moseley's law. Show that frequency of K<sub>α</sub> -line is given by.

$$\gamma_{K\alpha} = \frac{3}{4}RC(z-1)^2$$

**5**

P.T.O.

3. Attempt **any two** :

- a) The spacing between vibrational level of CO molecule is 0.08 eV. Calculate the value of force constant. Take mass of Carbon atom = 12 and that of oxygen 16 times mass of proton =  $1.67 \times 10^{-27}$  kg.

(Given  $h = 6.63 \times 10^{-34}$  Js, 1 eV =  $1.6 \times 10^{-19}$  J). 5

- b) A spectral line of wavelength  $4500 \text{ \AA}$  when placed in a magnetic field of 10 Tesla is observed to be a normal Zeeman triplet. Calculate wavelength separation between components of triplet.

(Given  $e = 1.6 \times 10^{-19}$  C,  $m = 9.1 \times 10^{-31}$  Kg and  $C = 3 \times 10^8$  m/s) 5

- c) Find the shortest wavelength present in the radiation from an x-ray machine whose accelerating potential is 100 KV. 5

4. A) Attempt **any one** :

- a) i) Show that vibrational energy is given by

$$E_v = \left( v + \frac{1}{2} \right) \hbar \sqrt{\frac{k}{\mu}} \quad \text{where symbols have their usual meanings.} \quad 4$$

- ii) Explain J J coupling scheme for two valence electron system using neat vector diagram. 4

- b) Compute singlet-triplet separations in terms of interaction energies between two valence electrons for p-d configuration. Draw a necessary schematic diagram. Assume LS-coupling. 8

B) Attempt **any one** :

- a) What are the applications of Raman spectra ? 2

- b) What is Larmour precession ? 2



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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**PHYSICS (Paper – VI) (New) (Elective – I)**  
**PH-336(A) : Astronomy and Astrophysics – I**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- N.B. :** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*  
3) *Draw neat diagrams wherever necessary.*

1. Attempt **all** of the following ( **1** mark **each**) : **10**
- a) What is meant by main sequence star ?
  - b) What is a solar flare ?
  - c) How do we calculate temperature from Weins law ?
  - d) Differentiate between a transit and occultation.
  - e) What is an Asteroid ?
  - f) What are white Dwarfs ?
  - g) What are promineances ?
  - h) What are Binary stars ?
  - i) What are Sayfert galaxies ?
  - j) What is the disadvantage of a Newtonion telescope ?
2. Attempt **any two** :
- a) What is a butterfly diagram ? **5**
  - b) How is rotational period of a star obtained from its spectra ? **5**
  - c) Explain the cassegrain reflector telescope. **5**

P.T.O.



3. Attempt **any two** :

- a) What is meant by solar maxima and solar minima ? 5
- b) Write a short note on HST. 5
- c) Explain the various types of Eclipses in detail. 5

4. A) Attempt **any one** :

- a) What are the spectral characteristics of O, B, A, F, G, K, M stars ? 8
- b) Write a short note on Quazar shift. 8

B) Attempt **any one** :

- a) What is 'Helium Flash' ? 2
  - b) What is neutron star ? 2
-



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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**PHYSICS (Paper – VI) (Elective – I)**  
**PH-336(B) : Elements of Material Science**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- N.B. :** 1) *All questions are compulsory.*  
2) *Figures to the **right** indicate **full** marks.*  
3) *Draw neat diagrams **wherever** necessary.*

1. Attempt **all** of the following ( **1** mark **each**) : **10**
- a) Enlist various mechanical properties of material.
  - b) If specific resistance of Aluminum is  $2.8 \times 10^{-6} \Omega \text{ cm}$ , what will be the resistance of Aluminium wire of 100 cm length and  $0.01 \text{ cm}^2$  cross section area ?
  - c) State various imperfections in solids.
  - d) Define CRSS (Critical Resolved Shear Stress).
  - e) What is Vulcanization ?
  - f) Define degree of polymerization.
  - g) What are different types of ceramics ?



- h) State Gibb's phase rule.
- i) How thermoset polymer differs from thermoplastic polymers ?
- j) State Fick's law for diffusion flux J.

2. Attempt **any two** of the following :

- a) What are different types of additives in polymers ? How they affect the properties of polymers ? 5
- b) With the help of neat diagram explain AX structure of NaCl. 5
- c) What factors affect solid solubility ? Explain. 5

3. Attempt **any two** of the following :

- a) At 1000°C there is 1.7 W/O carbon in solid solution with FCC iron. How many carbon atoms will be there in 100 cells ? (At.wt. of Fe = 55.85 amu and of C = 12.01 amu) 5
- b) A rod of copper should not be stressed more than 70 MPa (N/m<sup>2</sup>). What should be the diameter of the copper rod if it has to carry the load of 200 kg ? (g = 9.8 m/s<sup>2</sup>). 5
- c) A brine contains 9% of NaCl (91% of H<sub>2</sub>O) by weight. How many grams of water (per 100 gm brine) should evaporate to make the solution saturated at 50°C (solubility of NaCl in brine = 27% at 50° C). 5



4. A) Attempt **any one** of the following :

a) Draw and explain Pb-Sn (Lead-Tin) Phase diagram. **8**

b) What are various imperfections in crystals ? Explain them in details **8**

B) Attempt **any one** of the following :

a) Degree of polymerization in polyethylene is 800. If the monomer is  $C_2H_4$ ,  
what will be the molecular weight of it ? **2**

b) State thermal properties of materials. **2**

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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**PHYSICS (Paper – VI) (Elective – I)**  
**PH-336(C) : Motion Picture Physics – I**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- N.B. :** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*  
3) *Draw neat diagrams wherever necessary.*

1. Attempt **all** of the following ( 1 mark each) : **10**
- a) What is angle of view ?
  - b) What is a trace perspective ?
  - c) What is zoom ratio ?
  - d) Mention the various printing methods.
  - e) List the steps involved in processing a black and white negative film.
  - f) Define shutter speed.
  - g) State types of filters.
  - h) State different types of Enlarger.
  - i) What is depth of field ?
  - j) Mention shutter speed scale.
2. Attempt **any two** of the following :
- a) State and explain various reasons for using filters in B/W photography. **5**
  - b) Explain the characteristics and types of films. **5**
  - c) Explain characteristics and classification of printing papers. **5**





3. Attempt **any two** of the following :

- a) What are the factors affecting the developing process ? Explain in brief. **5**
- b) Explain Indoor lighting setup. **5**
- c) Explain operation of focal plane shutter. **5**

4. A) Attempt **any one** of the following :

- a) Explain construction, working and features of SLR camera. **8**
- b) Describe different stages involved in processing of photographic materials and chemicals used in these processing. **8**

B) Attempt **any one** of the following :

- a) Draw neat labelled diagram of condenser enlarger. **2**
- b) What do you mean by equivalent exposure ? **2**

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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**PHYSICS (Paper – VI) (Elective – I) (New)**  
**PH-336(D) : Biophysics**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- N.B. :** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*  
3) *Draw neat diagrams wherever necessary.*

1. Attempt **all** of the following ( **1 mark each** ) : **10**
- a) Give the composition of a cell.
  - b) What is Redox-couple ?
  - c) What do you mean by resting potential ?
  - d) Give the full form of EEG and EOG.
  - e) Define the term CMRR.
  - f) Give the principle of photodiode.
  - g) What is polarizable electrode ?
  - h) List the different leads of ECG.
  - i) Write the Nernst equation.
  - j) What do you mean by radioactivity ?
2. Attempt **any two** of the following :
- a) Write a short note on "Half Cell Potential". **5**
  - b) Discuss the functional aspects of mitochondria and chloroplast. **5**
  - c) Explain the principle, construction and working of capacitive transducer. **5**



3. Attempt **any two** of the following :

- a) With the help of a block diagram explain the construction and working of NMR. **5**
- b) Explain the principle, construction and working of calorimeter. **5**
- c) Discuss the construction and working of a centrifuge. **5**

4. A) Attempt **any one** of the following :

- a) What is ECG ? Discuss the principles, construction and working of a ECG machine. **8**
- b) What is electron microscope ? Explain in brief the principle and construction of SEM and TEM. **8**

B) Attempt **any one** of the following :

- a) What do you mean by 'Genetic code' ? **2**
- b) Give the uses of X-rays. **2**

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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**PHYSICS (Paper – VI) (New Course) (Elective – I)**  
**PH-336(E) : Medical Electronics**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- N.B. :*** 1) ***All questions are compulsory.***  
2) ***Figures to the right indicate full marks.***  
3) ***Draw neat diagrams wherever necessary.***

1. Attempt **all** of the following ( **1** mark **each**) : **10**
- a) Draw bridge circuit for measurement of resistance.
  - b) What is active transducer ?
  - c) What do you mean by ECG ?
  - d) What are bio-potential electrodes ?
  - e) Draw circuit symbol of OPAMP.
  - f) What do you mean by impedance ?
  - g) Give use of spectrophotometry.
  - h) What is hematology ?
  - i) State the normal B.P. values of male and female.
  - j) Define the term 'Diastole'.



2. Attempt **any two** :
- a) Explain the principle, construction and working of inductive sensor. 5
  - b) What is polarization ? Explain polarizable and non polarizable electrodes in brief. 5
  - c) Draw the circuit diagram of low pass and high pass active filters and explain it in detail. 5
3. Attempt **any two** :
- a) List the main types of blood tests. Explain any two in brief. 5
  - b) Explain the OPAMP as differentiator with the help of a suitable diagram. 5
  - c) Why are instruments essential in electronics ? 5
4. A) Attempt **any one** :
- a) What do you mean by Heart sound ? What is its significance ? 8
  - b) Explain standard and unipolar limb lead system used for recording the electrocardiogram 8
- B) Attempt **any one** :
- a) What is function of pacemaker ? When it is used ? 2
  - b) Give the difference between direct and indirect measurement of blood pressure. 2



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T.Y. B.Sc. (Semester – III) Examination, 2012  
CHEMISTRY (Paper – I)  
CH – 331 : Physical Chemistry  
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

- N.B. :** 1) *All questions are compulsory.*  
2) *Figures to the right indicates full marks.*  
3) *Use of logarithmic table and calculator are allowed.*  
4) *Actual calculations must be shown while solving the problems.*

1. Attempt the following : 10
- a) Define half life period of the reaction.
  - b) State the rotational constant and give the significance of the terms involved in it.
  - c) Define 'crystallography'.
  - d) Define heat of adsorption.
  - e) If Weiss indices are  $\frac{3}{2} : 2 : 1$ , what are the Miller indices ?
  - f) Draw BCC lattice.
  - g) Write selection rule for vibrational Raman spectra.
  - h) Write rate equation for the following chemical reaction  $2A + B \rightarrow 4C$ .
    - i) Define 'Energy of activation'.
    - j) Define wave number of the radiation.
2. A) Attempt **any two** of the following : 6
- i) Show that the half life period of the second order reaction is inversely proportional of the initial concentration of the reactants.
  - ii) Distinguish between IR and Raman spectra.
  - iii) Explain the crystallization and fusion with suitable examples.

P.T.O.



B) Solve **any one** of the following : 4

- i) The rotational constant for  $^1\text{H}^{35}\text{Cl}$  is observed at  $10.5908\text{ cm}^{-1}$  and rotational constant for HCl with different isotope of chlorine is at  $10.5739\text{ cm}^{-1}$ . Calculate the atomic mass of chlorine isotope.
- ii) Calculate the angle at which first order diffraction will occur in an X-ray diffractometer when X-rays of wave length  $1.54\text{ \AA}$  are diffracted by the atoms of a crystal, given that the interplanar distance is  $4.04\text{ \AA}$ .

3. Attempt **any two** of the following : 10

- i) Derive the expression of the velocity constant of the thermal decomposition of azoisopropane  $[(\text{CH}_3)_2\text{CHN}=\text{NCH}(\text{CH}_3)_2]$ .
- ii) Derive an expression for the rotational energy of a diatomic molecule taking it as a rigid rotator. Draw the rotational energy level diagram for such a molecule.
- iii) Explain the term Pseudo-molecular reaction with suitable examples.

4. A) Show that 6

$$(1 - \theta) = \frac{b'}{P}$$

Where  $\theta$  = fraction of surface covered by reactant.

$b'$  = constant

$P$  = Pressure of the gas in contact with adsorbent.

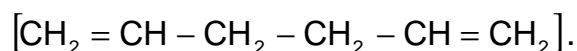
OR

A) Derive the relation between the wave length of X-ray diffracted, interplanar spacing of a crystal and angle of diffraction.

B) At  $100\text{ }^\circ\text{C}$ , the half life period for the thermal decomposition of  $\text{N}_2\text{O}_5$  is 4.6 sec. and is independent of the initial pressure of  $\text{N}_2\text{O}_5$ . Calculate the specific reaction rate constant at this temperature. 4

OR

B) Estimate the molar refraction at sodium D-line for 1, 5 hexadiene



[Given Refraction equivalents of

H : 1.100

C : 2.418

C = C : 1.733]



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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**CHEMISTRY (Paper – IV)**  
**CH – 334 : Analytical Chemistry**  
**(2008 Pattern) (New Course)**

Time : 2 Hours

Max. Marks : 40

- N.B. :** 1) *All questions are compulsory.*  
2) *Figures to the **right** indicate **full** marks.*  
3) *Use of log tables and calculators is **allowed**.*  
4) ***Neat** diagram must be drawn **wherever** necessary.*

1. Answer the following : 10

- 1) What is common ion effect ?
- 2) Give the statement of Faraday's First Law of Electrolysis.
- 3) What is molar absorptivity ?
- 4) Define electrochemical equivalent.
- 5) What is bathochromic shift ?
- 6) Give the principle of turbidimetry.
- 7) What is the role of monochromator used in FES ?
- 8) Define nebulization in AAS.
- 9) Give the principle of FES.
- 10) What is meant by spectral interference in AAS ?

2. a) Answer **any two** of the following : 6

- 1) Define decomposition potential. Explain the factors that affects decomposition potential.
- 2) Differentiate between colorimetry and spectrophotometry.
- 3) Explain the turbidimetric titration with suitable example.

P.T.O.





- b) Answer **any two** of the following : 4
- 1) Give the conditions for good precipitation.
  - 2) A current of 4.0 ampere is passed through a solution of silver nitrate for 50 minutes. Calculate the weight of silver deposited at cathode.  
(Electrochemical equivalent of silver =  $1.118 \times 10^{-3}$ )
  - 3) A coloured solution transmits 80% of the incident light at 340 nm. Calculate the absorbance of this solution at this wavelength.
3. Answer **any two** of the following : 10
- 1) Explain the term co-precipitation and post-precipitation. Give atleast three points to distinguish between them.
  - 2) With the help of block diagram describe instrumentation of AAS.
  - 3) Give the construction and working of total consumption burner and laminar flow burner used in F.E.S.
4. a) What is thermogravimetric analysis ? Give its types. Explain the factors that affects the TGA curve. 6
- OR
- a) i) What is photometric titration ? Draw and explain the photometric titration curve of  $\text{Cu}^{2+}$  ions when titrated against EDTA at 745 nm. 3
  - ii) Explain the factors affecting the nephelometric and turbidimetric measurements. 3
- b) Calculate the solubility of silver chromate in grams per litre at 25°C. 4
- (Given  $K_{sp}$  of  $\text{Ag}_2\text{CrO}_4 = 2.18 \times 10^{-12}$  , Mole. Wt.  $\text{Ag}_2\text{CrO}_4 = 332.0$ )
- OR
- b) Molar absorptivity of a particular solute is 21,000 lit.  $\text{Mol}^{-1} \cdot \text{cm}^{-1}$  at 510 nm. Calculate transmittance through a cuvette with 4.0 cm pathlength of a solution having concentration  $2.5 \times 10^{-6}$  Mole  $\text{lit}^{-1}$ .
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**T.Y.B.Sc. (Semester – III) Examination, 2012**  
**CHEMISTRY (Paper – V)**  
**CH – 335 : Industrial Chemistry**  
**(2008 Pattern) (New Course)**

Time : 2 Hours

Max. Marks : 40

- N.B. :** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*  
3) *Draw neat diagram and flowsheet wherever necessary.*

1. Answer the following : **10**
- i) What do you mean by unit process ?
  - ii) Give the important uses of sulphuric acid.
  - iii) What is meant by phosphatic fertilizers ?
  - iv) Define the term “Masseccute”.
  - v) Write important uses of ethyl alcohol.
  - vi) What is meant by biodegradable waste ?
  - vii) Define the term unit operation.
  - viii) What is a rectified spirit ?
  - ix) What do you mean by fermentation ?
  - x) Explain the term ‘Atom Economy’.
2. A) Attempt **any two** of the following : **6**
- i) Differentiate between continuous and batch process.
  - ii) Explain the importance of NPK ratio.
  - iii) Write a brief note on contact converter.
- B) Answer **any two** of the following : **4**
- i) Explain the term quality control and process control.
  - ii) What is meant by capital cost and production cost ?
  - iii) Explain the term “waste minimization”.

P.T.O.



3. Answer **any two** of the following : **10**
- i) Describe with flowsheet the manufacture of sugar from sugar cane with special reference to multiple effect evaporators.
  - ii) Discuss with flow sheet the manufacture of ethyl alcohol from food grains.
  - iii) What are types of industrial waste ? Discuss in brief each of these types of waste.
4. A) Explain with flow sheet and chemical reactions involved in the manufacture of ammonia by Haber Bosch process. **6**
- OR
- A) What are fertilizers ? Describe with flow sheet the manufacture of mixed fertilizers.
- B) Explain the two methods of testing and estimation of sugar. **4**
- OR
- B) What are basic requirement for fermentation ?
-



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T.Y. B.Sc. (Semester – III) Examination, 2012  
CHEMISTRY (Paper – VI) (Ele. – I)  
CH-336 (A) : Nuclear Chemistry  
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) **All** questions are **compulsory**.  
2) Figures to the **right** indicate **full** marks.  
3) Draw the diagrams **whenever** necessary.  
4) Use of log tables and calculator is **allowed**.

1. Answer the following : 10

a) Which of the following nuclei is more stable ?

- A)  ${}_{13}^{30}\text{Al}$       B)  ${}_{25}^{55}\text{Mn}$       C)  ${}_{8}^{16}\text{O}$       D)  ${}_{1}^2\text{H}$

b) What is the mass defect ? What is the relation between binding energy and mass defect ?

c) The isotone of  ${}_{1}^3\text{H}$  is

- A)  ${}_{1}^2\text{H}$       B)  ${}_{2}^4\text{He}$       C)  ${}_{2}^3\text{He}$       D)  ${}_{6}^{13}\text{C}$

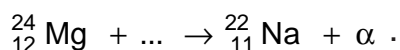
d) What are the magic numbers ?

e) Radium has a decay constant of  $4.33 \times 10^{-4} \text{ year}^{-1}$ . Calculate the half life.

f) State Geiger – Nuttal's law.

g) Write Bethe's notation. Give one example.

h) Complete the following nuclear reaction.



i) Define nuclear isomerism and isomeric transition.

j) State two applications of semi-empirical mass equation.

P.T.O.



2. A) Attempt **any two** of the following : **6**
- a) Discuss general characteristics of radioactive decay process.
  - b) Explain conservation of protons and neutrons in nuclear reaction.
  - c) Explain nuclear stability on the basis of even-odd nature of protons and neutrons.
- B) Answer **any two** of the following : **4**
- a) Calculate the binding energy of  ${}_{15}^{31}\text{P}$   
Given : Mass of proton = 1.008 amu  
Mass of neutron = 1.0078 amu  
Mass of  ${}^{31}\text{P}$  = 30.9840 amu
  - b) Write short note on  $\alpha$ -energy spectrum.
  - c) Define photonuclear reactions. What are the different types of photonuclear reactions ?
3. Answer **any two** of the following : **10**
- a) Define :
    - 1) Half-life 2) Average life and 3) Decay constant. Show that product of half life and decay constant is equal to 0.693. What is the order of radioactive disintegration ?
  - b) State and explain semi-empirical mass equation.
  - c) What is compound nucleus ? Discuss important features of compound nucleus theory.
4. A) Explain periodicity in nuclear properties in shell model. **6**
- OR
- A) What are the similarities between nucleus and a drop of liquid ? What are the merits of liquid-drop model ? **6**
- B) Explain different types of radioactive decay processes. **4**
- OR
- B)  ${}^{24}\text{Na}$  has half life of 14.8 hours. Find the time during which 90% of the element is disintegrated. **4**
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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**CHEMISTRY (Paper – VI) (Ele. – I)**  
**CH-336 (B) : Polymer Chemistry**  
**(2008 Pattern) (New Course)**

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*  
3) *Draw the diagrams whenever necessary.*  
4) *Use of log tables and calculator is allowed.*

1. Answer the following :

10

- i) Define the term – virgin polymer.
- ii) Draw the structure of polyamide polymer.
- iii) The chemist Leo Backeland invented the \_\_\_\_\_
- iv) Calculate the molecular weight of polyvinyl chloride. whose  $D_p$  value is 800.
- v) State whether the following statement is true or false : Polyethylene is the biodegradable polymer.
- vi) Give two important applications of Nylon 6,6.
- vii) Write the correct structure of polymer whose IUPAC name is ethyl-silane-triol.
- viii) Name any two commonly used photostabilizers.
- ix) Give the chemical name of teflon.
- x) Draw the structures of following monomers
  - a) Butadiene
  - b) Acrylonitrile

2. A) Explain the following (**any 3**) :

6

- i) Modern age is the gift of polymer.
- ii) Colourants are often used in polymers.
- iii) Celluloid is used for making billiard balls.
- iv) Epoxy resins are useful in ply-decor industries.



B) How will you distinguish between the following (any two) : 4

- i) Natural and synthetic polymers
- ii) Elastomers and Resins
- iii) Free radical polymerisation and Ionic polymerisation.

3. Answer **any two** of the following : 10

- i) Give a full account of melt polymerisation.
- ii) Discuss the crosslinking reactions of polymers in detail.
- iii) Describe the visco elasticity measurements of polymers specially related with mechanical properties.

4. A) Attempt **any two** of the following : 6

- i) A basket of apples contains sets of A, B, C and D with their numbers and weights of apples as shown below

Set A – 16 apples with its weight 150 g

Set B – 25 apples with its weight 200 g

Set C – 30 apples with its weight 250 g

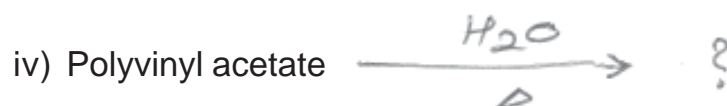
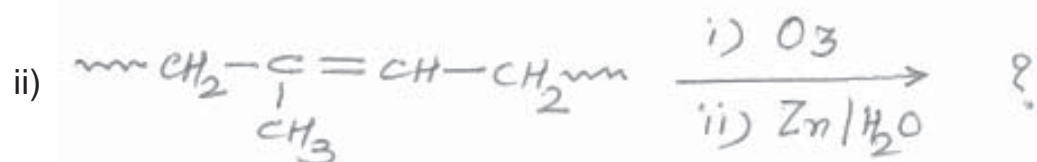
Set D – 40 apples with its weight 300 g

Calculate the number average molecular weight ( $\bar{M}_n$ ) for the apples.

- ii) Write a note on 'Aminolysis reaction of polymers'.
- iii) Give the brief account of ring opening polymerisation.

B) Complete the following polymer reactions. 4









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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**CHEMISTRY (Paper – VI) (Ele. – I)**  
**Biochemistry**  
**CH-336 (C) : Introduction to Biochemistry and Molecular Biology**  
**(New Course) (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*  
3) *Draw neat diagrams wherever necessary.*

I. Answer the following :

10

- 1) Write two functions of mitochondria.
- 2) Give examples of two steroid hormones.
- 3) What are reducing sugars ? Give example.
- 4) Write the structure of palmitic acid.
- 5) List out two examples of coenzymes.
- 6) Name two hormones of pancreas.
- 7) Define saponification number.
- 8) What are the monosaccharides that form sucrose ?
- 9) What are standard amino acids ? Give example.
- 10) Write MM equation.

II. A) Attempt **any two** :

6

- 1) Differentiate between anomers and epimers with suitable examples.
- 2) List out the biological functions of proteins.
- 3) Write note on dialysis technique.



- B) Give the structures of the following **any two** : **4**
- 1) Ser-Gly-Ala
  - 2) Maltose
  - 3) Lecithin

III. Answer **any two** of the following : **10**

- 1) Explain competitive, non competitive and uncompetitive enzyme inhibition with suitable examples.
- 2) Classify carbohydrates with suitable examples.
- 3) Differentiate between Prokaryotes and Eukaryotes with suitable diagram.

IV. Answer the following :

- A) Explain the principle, procedure and applications of Gel filtration. **6**

OR

- A) Explain the reactions of Amino acids with sanger's reagent, Dansyl chloride and Dabsyl chloride reagents and give their significance.

- B) Write note on simple and compound lipids. **4**

OR

- B) Write note on titration curve of glycine.
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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**CHEMISTRY (Paper – VI) (Ele. – I)**  
**CH-336 (D) : ENVIRONMENTAL Chemistry**  
**(2008 Pattern) (New Course)**

Time : 2 Hours

Max. Marks : 40

**Instructions :** i) *All questions are compulsory.*  
ii) *Figures to the right indicate full marks.*  
iii) *Neat diagrams must be drawn wherever necessary.*

1. Answer the following in short : **10**
- i) Define receptor.
  - ii) Give abnormal properties of water.
  - iii) Define the term B.O.D.
  - iv) What is photochemical smog ?
  - v) Define Thermal pollution.
  - vi) Give relation between ppb and ppt.
  - vii) Define : humin.
  - viii) What is stratification of water body ?
  - ix) What is aerosol ?
  - x) What is hardness of water ?
2. a) Attempt **any two** of the following : **6**
- i) Ozone chemistry in Atmosphere. Explain.
  - ii) Eutrophication : explain.
  - iii) Sediments in of environment : explain.
- b) Write short notes on (**any two**) : **4**
- i) Oil spills
  - ii) Pesticides
  - iii) Volcanoes.



3. Attempt **any two** of the following : **10**

- i) Discuss microbially mediated aquatic reactions involving Nitrogen transformation.
- ii) How the  $\text{SO}_x$  pollution in air is controlled and give the effects of  $\text{SO}_x$  pollution.
- iii) Explain the term chemical speciation and describe the chemical speciation of Arsenic.

4. a) Give major regions of atmosphere with respective altitude, temperature, ranges and important species. **6**

OR

Define the term C.O.D. and describe one method of its estimation.

b) Write short note on (**any one**) : **4**

- i) Bhopal Disaster
  - ii) Radioactive pollution.
-



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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**CHEMISTRY (Paper – VI) (Ele. – I)**  
**CH-336 (E) : Agriculture Chemistry**  
**(2008 Pattern) (New Course)**

Time : 2 Hours

Max. Marks : 40

**Instructions :** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*  
3) *Draw the diagrams wherever necessary.*

I. Answer the following :

10

- a) What is calcareous soil ?
- b) Give deficiency symptoms of calcium in plants.
- c) Define term agriculture chemistry.
- d) What is fertilizer ?
- e) Give mode of action of sulphur fungicide.
- f) Classify phosphatic fertilizers.
- g) What is the role of copper in plants ?
- h) What are bactericides ?
- i) Define saline soil.
- j) Define soil and soil conditioners.



2. A) Answer **any two** : 6

- 1) Explain the insecticidal activity of DDT and BHC.
- 2) What do you mean by fertilizer efficiency ? State the factors which affect the efficiency of fertilizer.
- 3) What are the objectives of agriculture chemistry ?

B) Attempt **any two** : 4

- 1) Discuss importance of soil pH.
- 2) What are the water quality problems related to environment and agriculture ?
- 3) Why are gypsum and calcium chloride cannot be used for improvement of acid soils ?

3. Attempt **any two** : 10

- A) What do you understand by soil temperature ? Discuss factors affecting soil temperature in detail.
- B) What is nitrification ? Explain how is the nitrogen fixation takes place in soil.
- C) Describe the construction and working of biogas plant.



4. A) Answer **any two** :

**6**

- 1) Discuss the importance of soil reaction.
- 2) Describe the major impurities found in raw water.
- 3) How are essential nutrients classified ?

B) Attempt **any two** :

**4**

- 1) What is Pryanishnikov triangle ?
  - 2) What do you understand by sewage irrigation ?
  - 3) Give classification of pest control measures.
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**T.Y. B.Sc. (Semester – III) Examination, 2012  
BOTANY (Paper – I) (New Course) (2008 Pattern)  
BO-331 : Algae, Fungi and Bryophyta**

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) *All questions are compulsory.*  
2) *Draw neat labelled diagrams wherever necessary.*  
3) *Figures to the right indicate full marks.*

1. Answer the following : 10
- a) Give any two general characters of Fungi.
  - b) Define Algae.
  - c) Give economic importance of *Saccharomyces*.
  - d) Give any one application of Mycorrhizae in Agriculture.
  - e) Give one economic importance of Bryophyta.
  - f) What is Gemmae ?
  - g) Give example of Hepaticopsida.
  - h) Give the name of disease caused by Cercospora.
  - i) Give any one economic importance of Nostoc.
  - j) Give any two general characters of Pyrophyta.
2. Attempt **any two** of the following : 10
- a) Describe structure of fruiting body in Oomycetes.
  - b) Describe thallus structure of Xanthophyta.
  - c) Give general characters of Anthocerotopsida.

P.T.O.





3. Write notes on **any two** : **10**

- a) Reproduction of Rhodophyta.
- b) Thallus structure of Myxomycetes.
- c) Systematic position with reasons fo Puccinia.

4. Describe in detail structure of Sporophyte in Polytrichum. **10**

OR

Give thallus structure, reproduction and economic importance of Batrachospermum.

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**T.Y.B.Sc. (Semester – III) Examination, 2012**  
**BOTANY (Paper – II) New Course (2008 Pattern)**  
**BO – 332 : Molecular Biology**

Time : 2 Hours

Max. Marks : 40

**Instructions :** i) **All questions are compulsory.**  
ii) **Draw neat labelled diagrams.**  
iii) **Figures to the right indicate full marks.**

1. Attempt the following : 10
  - a) Define transcription.
  - b) What is codon ?
  - c) Define genetic code.
  - d) Mention the contribution of Nirenberg and Khorana.
  - e) Define replicon.
  - f) What are inducible enzymes ?
  - g) Define muton.
  - h) Give the role of ribosomes in translation.
  - i) What is proteomics ?
  - j) Write the central dogma of molecular biology.
2. Attempt **any two** of the following. 10
  - a) Write about proteins as molecules of cell.
  - b) Explain structure and role of mRNA in translation.
  - c) Describe semi conservative mode of replication in brief.
3. Write notes on **any two** of the following. 10
  - a) One gene one enzyme hypothesis.
  - b) Split genes.
  - c) Structural genomics.
4. What is DNA damage ? Explain any four causes of monoadduct type DNA damages. 10

OR

Describe any two biological evidences to prove DNA as genetic material.



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**T. Y. BSc. (Semester – III) Examination, 2012**  
**BOTANY (Paper – III)**  
**BO-333 : Angiosperms and Evolution**  
**(New Course) 2008 Pattern**

Time : 2 Hours

Max. Marks : 40

- Instructions:** 1) *All questions are compulsory.*  
2) *Draw neat labelled diagrams wherever necessary.*  
3) *Figures to the right indicate full marks.*

1. Attempt the following : **10**
- a) Give an example of phyllogenetic system of classification.
  - b) Name type of inflorescence in family Magnoliaceae.
  - c) Give floral formula of family Nyctaginaceae.
  - d) Enlist two distinguishing characters of family Acanthaceae.
  - e) State two examples of family orchidaceae.
  - f) Enlist two similarities of Gnetales with Angiosperms.
  - g) Give standard size of Herbarium sheet.
  - h) Enlist two endemic plants of Maharashtra.
  - i) Where is regional circle of Western zone of BSI located ?
  - j) Mention any two phytogeographical regions of India.
2. Answer **any two** of the following : **10**
- a) Give distinguishing characters and two examples of family Lamiaceae
  - b) Explain importance of herbaria.
  - c) Discuss the contribution of Sir J.D. Hooker.

P.T.O.



3. Write short notes on **any two** of the following : **10**

a) Merits of Engler and Prantl's system of classification.

b) Pteridosperm theory of origin of Angiosperm.

c) Pseudoendemics.

4. Give distinguishing characters, floral formula and floral diagrams of Asteraceae and Papaveraceae. **10**

OR

4. What is Evolution ? Discuss mutations and recombinations as sources of variation. **10**

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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**BOTANY (Paper – IV)**  
**BO – 334 : Genetics and Plant Breeding**  
**(New Course) (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- Instructions :** i) **All** questions are **compulsory**.  
ii) Figures to the **right** indicate **full** marks.  
iii) Draw **neat** labelled diagrams **wherever** necessary.

1. Answer the following : 10
- a) Define multiple alleles.
  - b) What is monohybrid cross ?
  - c) Define polygenic inheritance.
  - d) What is linkage ?
  - e) Define sex-linked genes.
  - f) What are spontaneous mutations ?
  - g) Define monosomics.
  - h) Give any two objectives of plant breeding.
  - i) What is emasculation ?
  - j) Give any two applications of mutation breeding.
2. Answer **any two** of the following : 10
- a) Explain supplementary gene interaction with a suitable example.
  - b) What is gene map ? Explain gene mapping by two point test cross.
  - c) Give objectives of plant introduction.

P.T.O.



3. Write notes on (**any two**) : **10**

a) Dihybrid cross.

b) Chloroplast genome.

c) Dominance hypothesis.

4. What are chromosomal aberrations ? Explain origin and effects of deletions and duplications. **10**

OR

What is pure line ? Explain pureline selection method of crop improvement. **10**

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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**BOTANY (Paper – V)**  
**BO – 335 : Biometry and Computer Applications**  
**(2008 Pattern) (New Course)**

Time : 2 Hours

Max. Marks : 40

**Instructions:** i) *All questions are compulsory.*  
ii) *Draw neat and labelled diagrams wherever necessary.*  
iii) *Figures to the right indicate full marks.*

1. Answer the following : **10**
- a) What is frequency ?
  - b) Define mean deviation.
  - c) Enlist types of graphs.
  - d) What is mean ?
  - e) Define variable.
  - f) What is search engines ?
  - g) Define RAM.
  - h) What is WAN ?
  - i) What is website ?
  - j) What is memory ?
2. Attempt **any two** of the following : **10**
- a) Give applications of probability in biological sciences.
  - b) Applications and limitations of chi-square test.
  - c) Mention the advantages of networking.

P.T.O.



3. Write short notes on **any two** of the following : **10**
- a) Standard deviation.
  - b) Photoshop.
  - c) Paint brush.

4. What is correlation ? Describe types of correlation with suitable example. **10**

OR

Give an account of M.S. Excell.

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Seat No.	
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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**ZOOLOGY (Paper – I)**  
**ZY-331 : General Zoology (2008 Pattern)**  
**(New Course)**

Time : 2 Hours

Max. Marks : 40

- N.B. :** 1) *All questions are compulsory.*  
2) *Neat labelled diagrams must be drawn wherever necessary.*  
3) *Figures to the right indicate full marks.*

1. Attempt the following : **10**
- 1) Give scientific name of Pila.
  - 2) Define Pleurodont dentition.
  - 3) State function of statocyst in Pila.
  - 4) Give an example of Hemichordata.
  - 5) Enlist two types of sperms in Pila.
  - 6) State the location of pecten in calotes.
  - 7) Enlist any two larval forms in crustacea
  - 8) Define mesonephric kidney.
  - 9) State the location of pentagonal scale in calotes.
  - 10) State the habitat of Pila.
2. Attempt **any two** of the following : **10**
- i) Sketch and labelled Pallial complex.
  - ii) Describe electric organs in fishes.
  - iii) Describe food, feeding and digestion in calotes.

P.T.O.



3. Write short notes on **any two** of the following : **10**
- a) Dipnoi
  - b) Digestive gland in Pila.
  - c) Sense organs in calotes.
  - d) Sphenodon as a living fossil.
4. Describe morphological variations in different regions of brain of scoliodon and frog. **10**

OR

Describe female reproductive system of calotes.



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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**ZOOLOGY (Paper – II) (2008 Pattern)**  
**ZY – 332 : Mammals Histology**  
**(New Course)**

Time : 2 Hours

Max. Marks : 40

- N.B. :** 1) *All questions are compulsory.*  
2) *Neat labelled diagrams must be drawn wherever necessary.*  
3) *Figures to the right indicate full marks.*

1. Attempt the following : 10
- 1) Define squamous epithelium.
  - 2) State the functions of Leydig's cells.
  - 3) What are Peyer's patches ?
  - 4) What is hepatic lobule ?
  - 5) Define alpha cells.
  - 6) Mention any two types of cells from gastric gland.
  - 7) What is demilune ?
  - 8) Define Brunner's gland.
  - 9) What is dental pulp ?
  - 10) What is merocrine secretion ?
2. Attempt **any two** of the following : 10
- i) Describe histological structure of submandibular salivary gland.
  - ii) Describe histological structure of trachea.
  - iii) Describe histo chemical reaction for demonstration of proteins.
3. Write notes on **any two** : 10
- a) Sketch and label v.s. of skin
  - b) Taste bud
  - c) Histology of adrenal gland
  - d) Connective tissue.
4. Describe histological structure of ovary.
- OR
4. Describe histological structure of oesophagus. 10
-



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Seat No.	
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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**ZOOLOGY (Paper – III)**  
**ZY-333 : Biological Chemistry**  
**(2008 Pattern) (New Course)**

Time : 2 Hours

Max. Marks : 40

- N.B. :** 1) *All questions are **compulsory**.*  
2) *Neat labelled diagrams must be drawn **wherever** necessary.*  
3) *Figures to the **right** indicate **full** marks.*

1. Answer the following : **10**
- 1) Define mutarotation.
  - 2) Define coenzyme.
  - 3) What is Michaelis constant  $K_m$  ?
  - 4) What are osazones ?
  - 5) Name the proteins possessing quaternary structure.
  - 6) What are lecithins ?
  - 7) What are zwitter ions ?
  - 8) Give biological significance of ca.
  - 9) Name the enzyme first to appear in urine during myocardial infarction.
  - 10) Which amino acid gives yellow colour with nin-hydrin reagent ?
2. Attempt **any two** of the following : **10**
- i) What are buffers ? Explain Acidosis and Alkalosis with the help of Biocarbonate buffer.
  - ii) State the biological role of lipids.
  - iii) Explain poly saccharides.

P.T.O.



3. Write notes on **any two** of the following : **10**

- a) Emulsification.
- b)  $\beta$  . pleated structure of protein.
- c) Structure of water.
- d) Unsaturated fatty acids.

4. What are vitamins ? Give an account of fat soluble vitamins with respect to their occurrence, biological functions and effects of deficiency. **10**

OR

What are enzymes ? Describe factors affecting enzymatic activity.

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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**ZOOLOGY (Paper – V) (Ele. – I)**  
**ZY – 335 (a) : General Pathology (New Course)**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- N.B. :** 1) *All questions are compulsory.*  
2) *Neat labelled diagrams must be drawn wherever necessary.*  
3) *Figures to the right indicate full marks.*

1. Attempt the following : 10
- 1) What is histopathology ?
  - 2) Define disease.
  - 3) What is melanosis ?
  - 4) Name two types of pathologic calcification.
  - 5) What is oedema ?
  - 6) Mention types of acute leukaemia.
  - 7) What is chronic inflammation ?
  - 8) Name the diseases caused by bacteria.
  - 9) Define biopsy.
  - 10) What is repair ?
2. Attempt **any two** of the following : 10
- i) What is necrosis ? Explain the different types of necrosis.
  - ii) Describe the importance and procedure of renal function test.
  - iii) What is embolism ? Explain the types and effects of embolism.
3. Write notes on **any two** of the following : 10
- |                             |                  |
|-----------------------------|------------------|
| a) Metastatic calcification | b) Benign tumour |
| c) Dry Gangrene             | d) Thrombosis    |
4. What is degeneration ? Describe the causes, changes and effects of cloudy and mucoid degeneration.
- OR
- What is haemorrhage ? Explain the causes, types and effects of haemorrhage. 10

P.T.O.



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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**ZOOLOGY (Paper – V) (2008 Pattern) (Ele. – I)**  
**ZY – 335 (b) : Basic Entomology**  
**(New Course)**

Time : 2 Hours

Max. Marks : 40

- N.B. :** i) *All questions are compulsory.*  
ii) *Neat labelled diagrams must be drawn wherever necessary.*  
iii) *Figures to the right indicate full marks.*

1. Attempt the following : 10
  - 1) Explain prognathous type of head.
  - 2) What is oligopodons larva ?
  - 3) Define moulting.
  - 4) Enlist the thoracic appendages.
  - 5) Name any two types of antennae.
  - 6) What is tegmina ?
  - 7) What is medical entomology ?
  - 8) Any two uses of insects in tissue culture.
  - 9) Which insect produce cochineal dye ?
  - 10) What is halter ?
2. Attempt **any two** of the following : 10
  - i) Describe fossorial type of leg.
  - ii) Describe sound producing organ in cicada.
  - iii) Describe different types of insect pupae.
3. Write notes on **any two** of the following : 10
  - a) Basic structure of wing and wing venation.
  - b) Bioluminescence in insect.
  - c) Hormonal control of metamorphosis.
  - d) Structure of integument in insects.
4. What is pheromone ? Describe the different types of sex pheromones in insects. 10

OR
4. Describe the different types of the mouth parts in insects.



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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**ZOOLOGY (Paper – VI)**  
**ZY – 336 : Cell Biology (2008 Pattern)**  
**(New Course)**

Time : 2 Hours

Max. Marks : 40

- N.B. :** 1) *All questions are compulsory.*  
2) *Neat labelled diagrams must be drawn wherever necessary.*  
3) *Figures to the right indicate full marks.*

1. Attempt the following : 10
- 1) Define microsomes.
  - 2) Enlist various tree radicals.
  - 3) Give any two functions at nucleus.
  - 4) Define cytoskeleton.
  - 5) Define Eukaryotic cell.
  - 6) Define somatic mutation.
  - 7) State importance of spindle fibres.
  - 8) What is pinocytosis.
  - 9) Enlist two functions of Golgi complex.
  - 10) Define apoptosis.
2. Attempt **any two** of the following : 10
- i) Distinguish between mitosis and meiosis.
  - ii) Describe polymorphism in lysosomes.
  - iii) Mitochondria are called as semiautonomous organelle. Discuss.

P.T.O.





3. Write notes on **any two** of the following : **10**
- a) Ultrastructure of microtubule.
  - b) Nuclear pore complex.
  - c) Functions of Endoplasmic reticulum.
  - d) Ultrastructure of centriole.

4. What is plasma membrane ? Describe fluid mosaic model of plasma membrane. **10**

OR

- What is cancer ? Describe various causes of cancer. **10**
-



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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**GEOLOGY (Paper – IV) (2008 Pattern)**  
**GL-334 : Structural Geology**

Time : 2 Hours

Max. Marks : 40

- Instructions :**
- 1) **All** questions are **compulsory**.
  - 2) **All** questions carry **equal** marks.
  - 3) **Black figures to the right indicate full marks.**
  - 4) **Neat diagrams must be drawn wherever necessary.**

1. Answer the following in **2/3** lines. **10**
  - a) What is hydrostatic pressure ?
  - b) What is Reicke's principle ?
  - c) Define ultimate strength of rock.
  - d) What is plastic deformation of rocks ?
  - e) Define lineation.
  - f) What is shear folding ?
  - g) Define dip slip fault.
  - h) Define twin gliding.
  - i) Economic importance of salt dome.
  - j) Define Plunge of a fold.
  
2. Write notes on (**any two**) : **10**
  - a) Give the principles of mechanics of folding.
  - b) Give the relation of structural geology with other branches.
  - c) Describe folds resulting from vertical movements.

P.T.O.



3. Write notes on (**any two**) : **10**
- a) Describe the concept of strain ellipsoid.
  - b) Give the composition of salt domes.
  - c) Explain the fracture cleavage.
4. What are foliation ? Describe different types of foliations. Add a note on the origin of slaty cleavage. **10**

OR

4. a) Explain the mechanics of Gravity faulting. **5**
- b) Composition and resolution of forces. **5**

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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**GEOLOGY (Paper – V)**  
**(2008 Pattern)**  
**GL 335 : Precambrian Stratigraphy of India**

Time : 2 Hours

Max. Marks : 40

- Instructions :**
- 1) **All questions are compulsory.**
  - 2) **All questions carry equal marks.**
  - 3) **Black figures to the right indicate full marks.**
  - 4) **Neat diagrams must be drawn wherever necessary.**

1. Answer the following in **2/3** lines. **10**
- a) Give names of cratons in southern Peninsula.
  - b) Give tectonic elements of continents.
  - c) Name the precambrian formations of western sector of Himalayas.
  - d) What are Gondites ?
  - e) Give subdivisions of Proterozoic EOn.
  - f) Give the names of subdivisions of Vindhyan supergroup.
  - g) On which craton Dongargarh granite is found ?
  - h) Where are Malani volcanics found ?
  - i) Give geographical location of Chalk Hills.
  - j) Where is Daling Group exposed ?

P.T.O.



2. Write notes on **any two**. **10**

- a) Comparison of stratigraphy of peninsular and extra-peninsular Regions.
- b) Salkhala Group
- c) Bhima Group

3. Write notes on **any two** : **10**

- a) Economic importance of rocks of Singhbhum craton.
- b) Life during Vindhya.
- c) Stratigraphic succession of Sauser Group.

4. Give the geographic distribution, classification with stratigraphic succession, lithology and economic importance of

DELHI SUPER GROUP

OR

DHARWAR SUPER GROUP

**10**





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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**STATISTICS (Principal) (Paper – II)**  
**ST-332 : Theory of Estimation**  
**(2008 Pattern) (New Course)**

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*  
3) *Use of scientific calculator and Statistical Tables is allowed.*  
4) *Symbols and abbreviations have their usual meanings.*

1. Attempt **each** of the following :

a) In each of the following cases, choose the correct alternative. **(1 each)**

i) If  $\bar{X}$  is mean of random sample of size  $n$  from  $N(\mu, \sigma^2)$  distribution,  $\sigma^2$  known, then which of the following statements is not correct ?

- A)  $\bar{X}$  is sufficient for  $\mu$                       B)  $\bar{X}$  is consistent estimator of  $\mu$   
C)  $\bar{X}$  is a biased estimator of  $\mu$         D)  $\bar{X}$  is m.l.e. of  $\mu$

ii) If  $T_1$  and  $T_2$  are two unbiased estimators of parameter  $\theta$ , then the relative efficiency of  $T_2$  w.r.t.  $T_1$  is given by

- A)  $\frac{\text{var}(T_1)}{\text{var}(T_2)}$                       B)  $\frac{\text{var}(T_2)}{\text{var}(T_1)}$   
C)  $\sqrt{\frac{\text{var}(T_1)}{\text{var}(T_2)}}$                       D)  $\sqrt{\frac{\text{var}(T_2)}{\text{var}(T_1)}}$

P.T.O.



iii) Let  $X \sim B(n, p)$ . A single observation is available from distribution of  $X$ . Then which of the following statements is correct ?

- A)  $\frac{X}{n}$  is biased but consistent estimator of  $p$
- B)  $\frac{X}{n}$  is unbiased and consistent estimator of  $p$
- C)  $\frac{X}{n}$  is unbiased but not consistent estimator of  $p$
- D)  $\frac{X}{n}$  is biased and not consistent estimator of  $p$

iv)  $X_1, X_2, \dots, X_n$  is a random sample from  $N(\mu, \sigma^2)$  distribution with  $\mu$

known. Let  $S_0^2 = \frac{\sum_{i=1}^n (X_i - \mu)^2}{n}$ . Then  $100(1 - \alpha)\%$  confidence interval for

$\sigma^2$  is given by

- |  |  |
|--|--|
| A) $\left( \frac{nS_0^2}{x_{n, 1-\frac{\alpha}{2}}^2}, \frac{nS_0^2}{x_{n, \frac{\alpha}{2}}^2} \right)$ | B) $\left( \frac{x_{n, 1-\frac{\alpha}{2}}^2}{nS_0^2}, \frac{x_{n, \frac{\alpha}{2}}^2}{nS_0^2} \right)$ |
| C) $\left( \frac{nS_0^2}{x_{n, \frac{\alpha}{2}}^2}, \frac{nS_0^2}{x_{n, 1-\frac{\alpha}{2}}^2} \right)$ | D) $\left( \frac{x_{n, \frac{\alpha}{2}}^2}{nS_0^2}, \frac{x_{n, 1-\frac{\alpha}{2}}^2}{nS_0^2} \right)$ |

b) In **each** of the following cases, state whether the given statement is **True** or

**False** :

**(1 each)**

- i) If  $T$  is unbiased estimator of  $\theta$ , then  $T^2$  is also an unbiased estimator of  $\theta^2$ .
- ii) m.l.e. of parameter  $\theta$  is consistent estimator of  $\theta$ .



- c) i) State Pitman-Koopman form of density function of r.v. X. 1
- ii) Prove or disprove : If there exist two biased estimators of parameter  $\theta$ , then there exist, infinitely many unbiased estimator of  $\theta$ . 1
- d) Define the following terms : (1 each)
  - i) Parameter space.
  - ii) Pivotal quantity.

2. Attempt **any two** of the following : (5 each)

- a) State Neyman's factorisation criterion for finding sufficient statistic for unknown parameter  $\theta$ .

Show that  $\prod_{i=1}^n X_i$  is a sufficient statistic for  $\theta$  when a random sample of size  $n$  is available from distribution of random variable (r.v.)  $X$  with probability density function (p.d.f.) given by

$$f(x; \theta) = \theta x^{\theta-1}, \quad 0 \leq x \leq 1, \theta > 0$$
$$= 0, \quad \text{otherwise}$$

- b) Explain the method of moments for estimation of parameters. A discrete r.v.  $X$  has p.m.f.

$$P(X = x) = \theta(1 - \theta)^x, \quad x = 0, 1, 2, \dots,$$
$$0 < \theta < 1$$
$$= 0, \quad \text{otherwise}$$

Show that  $\frac{1}{X+1}$  is a moment estimator of  $\theta$ .

- c) Prove that an estimator is consistent if its bias and variance both tend to zero as sample size  $n \rightarrow \infty$ .





3. Attempt **any two** of the following : **(5 each)**

a) Prove that Minimum Variance Unbiased Estimator (MVUE) if it exists, is unique.

b) Define Fisher's information function  $I(\theta)$ .

Obtain  $I(\lambda)$  when a r.v.  $X$  follows Poisson distribution with parameter  $\lambda$ .

c) Explain the method of maximum likelihood for estimation of parameter.

Find m.l.e. of parameter  $\theta$  when a random sample of size  $n$  is available from exponential distribution, with p.d.f.

$$f(x; \theta) = \begin{cases} \frac{1}{\theta} e^{-x/\theta} & , x \geq 0, \theta > 0 \\ = 0 & , \text{otherwise} \end{cases} .$$

4. Attempt **any one** of the following :

a) i) State and prove Cramer-Rao Inequality. **7**

ii) Find m.l.e. of parameter  $\theta$  when a random sample of size  $n$  is available from  $U(0, \theta)$  distribution. **3**

b) i)  $X_1, X_2, X_3$  is a random sample from  $B(1, p)$  distribution. Let  $T_1 = \frac{X_1 + X_2}{2}$

$$\text{and } T_2 = \frac{X_1 + 2X_2 + X_3}{4} .$$

Show that both  $T_1$  and  $T_2$  are unbiased estimators of  $p$ . Find efficiency of  $T_2$  with respect to  $T_1$ . **5**

ii) Obtain 95% confidence interval for  $\mu$  when a random sample of size 25 is available from  $N(\mu, 4)$  distribution. Value of sample mean is given to be 30. **5**



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**T.Y.B.Sc. (Semester – III) Examination, 2012**  
**STATISTICS (Principal)**  
**Paper – III (2008 Pattern)**  
**ST-333 : Statistical Process Control (Online Methods)**

Time : 2 Hours

Max. Marks : 40

- Instructions :**
- i) All questions are compulsory.*
  - ii) Figures to the **right** indicate **full** marks.*
  - iii) Use of scientific calculator and statistical tables is **allowed**.*
  - iv) Symbols and abbreviations have their usual meaning.*

1. Attempt **each** of the following :

- a) Choose the correct alternative in each of the following : **(1 each)**
- i) Which of the following is not a seven PC tools of SPC ?  
A) Check Sheet    B) Histogram    C) Ogive    D) Control Chart
  - ii)  $\bar{X}$  - chart is used to control  
A) Process average    B) Process standard-deviation  
C) Process fraction-defective    D) No. of defects per unit
  - iii) When process standard deviation  $\sigma$  is not known it is estimated by  
A)  $\bar{R}/C_2$     B)  $\bar{R}/d_2$     C)  $\bar{R}/D_1$     D)  $\bar{R}/D_3$
  - iv) Control limits of C chart are based on  
A) Uniform distribution    B) Hypergeometric distribution  
C) Binomial distribution    D) Poisson distribution

P.T.O.



- b) State whether each of the following statements is true (T) or false(F). (1 each)
- i) A process is said to be under control if all points are distributed between LCL and UCL but not randomly.
  - ii) For X-MR chart if  $\bar{X} = 33.52$ ,  $\overline{MR} = 0.48$ ,  $d_2 = 1.128$ , LCL is 32.25.
- c) Distinguish between
- i) Defect and defective 1
  - ii) On line process control methods and offline process control methods. 1
- d) i) Define the term capability index  $C_p$ . 1
- ii) Give interpretation of “low spots” on p-chart. 1
2. Attempt **any two** of the following : (5 each)
- a) Write a short note on cause and effect diagram (CED).
  - b) Explain the construction of p-chart where control limits are based on standardised values of ‘p’. Also interpret high spots.
  - c) For 25 samples of size 4,  $\bar{X} = 0.45$  and  $\bar{R} = 0.01$  obtain  $3\sigma$  control limits. If the process average shifts to 0.455, calculate the probability of catching the shift on (i) first sample after the shift, (ii) second sample after the shift.
3. Attempt **any two** of the following : (5 each)
- a) Explain the factors to be considered in determining size of subgroups and frequency of subgroups in the construction of control charts for attributes.
  - b) Define capability ratio ( $C_p$ ). Also state its interpretation.
  - c) Give justification for the use of  $3\sigma$  limits on control charts.
4. Attempt **any one** of the following :
- a) i) Explain the construction of c-chart when standards are not given. Further show that  $LCL > 0 \Leftrightarrow \bar{C} > g$ . 7
  - ii) Which are the 7 PC tools ? 3
  - b) i) Explain the concept of confirming run length chart (CRL). Also state its interpretation. What is the distinction between CRL and p-chart. 7
  - ii) State any three criteria for detecting lack of process control. 3



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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**STATISTICS (Principal) (Paper – IV)**  
**ST-334 : Design of Experiments**  
**(2008 Pattern) (New Course)**

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) **All questions are compulsory.**  
2) **Figures to the right indicate full marks.**  
3) **Use of scientific calculator and Statistical Tables is allowed.**  
4) **Symbols and abbreviations have their usual meaning.**

1. Attempt **each** of the following :

a) Choose the correct alternative in each of the following : **(1 each)**

i) In RBD with 5 blocks and 5 treatments , degrees of freedom for block s.s are

- A) 25                      B) 16                      C) 4                      D) 5

ii) In CRD with  $r = \sum_{i=1}^t r_j$ , total number of units, the total sum of squares is

- A)  $\sum \sum (x_{ij} - \bar{x}_{.})^2$                       B)  $\sum \sum (x_{ij} - \bar{x}_{i.})^2$   
C)  $\sum n_i (\bar{x}_{i.} - \bar{x}_{.})^2$                       D)  $\sum \sum n_i (\bar{x}_{.j} - \bar{x}_{.})^2$

iii) In  $2^2$ - factorial experiment, the expression for main effect B is

- A)  $\frac{1}{2}(a-1)(b+1)$                       B)  $\frac{1}{2}(a+1)(b-1)$   
C)  $\frac{1}{2}(a-1)(b-1)$                       D)  $\frac{1}{2}(a+1)(b+1)$

iv) The degrees of freedom for treatment in LSD is 4. Hence degrees of freedom for error is

- A) 4                      B) 8                      C) 10                      D) 12

P.T.O.



b) State whether **each** of the statements is **true** or **false** : ( 1 each)

i) The reciprocal of the variance of the mean is defined as precision.

ii) In ANOCOVA, the main variable and the concomitant variable are not correlated.

c) Define **each** of the following terms. (1 each)

i) Replication

ii) Experimental error.

d) i) Explain the concept of total confounding. 1

ii) Explain the concept of split plot design. 1

2. Attempt **any two** of the following : (5 each)

a) State the mathematical model in RBD with underlying assumptions. Also obtain the least square estimate of block effect.

b) Obtain the expectation of treatment sum of squares in LSD.

c) Explain the concept of ANOCOVA. Give the mathematical model and ANOCOVA table in CRD.

3. Attempt **any two** of the following : (5 each)

a) Explain the procedure of testing equality of two treatments means in case of RBD.

b) Obtain the efficiency of L.S.D. over R.B.D. when columns are taken as blocks, if the following information is available.

Rows s.s = 259.5375, Columns s.s = 155.2725 Treatments s.s = 1372.1225,  
Error s.s = 156.37 Treatment d.f. = 3

c) Explain Kruskal Wallis H test.



4. Attempt **any one** of the following :

- a) i) Explain with suitable example whole plot treatments and subplot treatments in split plot design. 5
- ii) Explain what is linear contrast ? How will you test the significance of linear contrast of treatment effects in CRD ? 5
- b) i) What are factorial experiments ? State the expression for highest order interaction effect in a  $2^3$  factorial experiment. 5
- ii) Explain Yate's procedure to obtain factorial effect totals in  $2^2$  factorial experiments. 5

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**T.Y.B.Sc. (Semester – III) Examination, 2012**  
**STATISTICS (Principal) (Paper V)**  
**ST – 335 : C – Programming (Turbo-C)**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) **All questions are compulsory.**  
2) **Figures to the right indicate full marks.**  
3) **Use of scientific calculator and statistical tables is allowed.**  
4) **Symbols and abbreviations have their usual meanings.**

1. Attempt **each** of the following :

a) In **each** of the following cases choose the correct alternatives.

i) The expression  $(9/4) * (2\%5)$  evaluates to

- A) 0                      B) 4                      C) 1.5                      D) 5

ii) The conversion specification used for reading integer item is

- A) % f                      B) % s                      C) % c                      D) % d

iii) Which of the following is not an arithmetic operator ?

- A) \*                      B) +                      C) –                      D) >

iv) By the declaration `int x [3] [2]`, the number of elements in an array x is equal to

- A) 6                      B) 5                      C) 3                      D) 2                      **1 each**

b) State whether **each** of the following is **true** or **false**.

i) One structure cannot be included as a member in another structure.

ii) An array name is a pointer variable.                      **1 each**

c) i) State the syntax and usage of `getchar ()` and `putchar ()` functions in C.                      **1**

ii) What do you mean by calling a function by reference ?                      **1**

d) i) Explain conditional operator in C.                      **1**

ii) What is pointer in c ? How is it declared ? Give one example.                      **1**

P.T.O.



2. Attempt **any two** of the following :

- a) Write a C program to find and print maximum of 10 numbers.
- b) Explain each of the following statements giving their syntax, usage and example.  
if...else, for, break.
- c) Write a C program to find mean and variance of 10 numbers. **(5 each)**

3. Attempt **any two** of the following :

- a) Write a C program to find the real roots of a quadratic equation  $ax^2 + bx + c = 0$ .
- b) What is structure in C ? How is it declared, stored and accessed ? Explain with illustration.
- c) Write a C program to check whether a given integer n is prime or not. **5 each**

4. Attempt **any one** of the following :

- a) i) Write a C program to find GCD of two numbers.  
ii) Draw a flowchart to find functional of positive integer number. **(5+5)**
- b) i) What is recursion ? Write a recursive function to find the value of  $x^n$  where x is real and n is integer.  
ii) Write a C program to find sum of digits of an integer n. **(5+5)**





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**T.Y.B.Sc. (Semester – III) Examination, 2012**  
**GEOGRAPHY (Paper – IV)**  
**Gg – 334 : India-A Geographical Study (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- N.B. :** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*  
3) *Diagrams and Maps must be drawn wherever necessary.*  
4) *Use of maps stencils is allowed.*

1. Answer the following questions in **one** or **two** sentences : **10**
- a) With which country does India share the shortest land border ?
  - b) Name two states where the Tertiary Rock systems are predominant.
  - c) What is the Bhabar Region ?
  - d) Name two East flowing rivers.
  - e) Name two areas experiencing very low rainfall.
  - f) State two regions important for Moist Deciduous forests.
  - g) Name two areas affected by Water Logging.
  - h) State two regions important for Laterite soils.
  - i) State two species of Equatorial forests commonly found in India.
  - j) Name the Seasons experienced in India.
2. Write short answers (**any two**) : **10**
- a) The characteristics of the Peninsular River Systems.
  - b) The problem of Soil Degradation in India.
  - c) Explain the mechanism of the Indian Monsoon.

P.T.O.



3. Write short notes (**any two**) : **10**

- a) The North Indian plains.
- b) Conservation of forests in India.
- c) Geopolitics of the Indian Ocean.

4. Divide India into Major Climate Regions and discuss any one of them in detail. **10**

OR

Discuss the Major Soil types in India and their importance for agriculture.





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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**GEOGRAPHY (Paper – V)**  
**Gg – 335 : Geography of Soils (New) (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- N.B. :** 1) *All questions are **compulsory**.*  
2) *Figures to the **right** indicate **full** marks.*  
3) *Diagrams and maps must be drawn **wherever** necessary.*  
4) ***Use** of map stencils is **allowed**.*

1. Answer the following questions in **one** or **two** sentences : **10**
- a) Define soil.
  - b) What is soil temperature ?
  - c) What is soil colour ?
  - d) Define anion.
  - e) What is oxidation ?
  - f) What is biological weathering ?
  - g) What are primary minerals ?
  - h) What is pedology ?
  - i) What is redox potential ?
  - j) Define zonal soil.
2. Write short answers (**any two**) : **10**
- a) Distinguish between weathering and soil erosion.
  - b) What is soil pH ?
  - c) Explain the formation of soils.

P.T.O.



3. Write short notes (**any two**) :

a) Soil porosity and bulk density.

b) Water holding capacity of soil.

c) Types of weathering.

**10**

4. Describe in detail the processes involved in chemical weathering.

OR

Give an account of soil classification.

**10**

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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**GEOGRAPHY (Paper – VI)**  
**Gg – 336 : Fundamentals of Geoinformatics – II (New) (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- N.B.:** 1) **All questions are compulsory.**  
2) **Figures to the right indicate marks.**  
3) **Diagrams and maps must be drawn wherever necessary.**  
4) **Use of map stencils is allowed.**

1. Answer the following questions in **one** or **two** sentences : **10**
- a) What is emission ?
  - b) What are fiducial marks on an aerial photograph ?
  - c) State the relationship between wavelength and frequency.
  - d) What do you understand by panchromatic photographs ?
  - e) Mention any three types of scattering.
  - f) What is thermal IR ?
  - g) State any two characteristics of electromagnetic radiation.
  - h) What is transmission ?
  - i) What do you understand by a stereograms ?
  - j) What are swing and tilts of aircraft ?
2. Write short answers (**any two**) : **10**
- a) What do you understand by Electromagnetic spectrum ?
  - b) Explain aerial photographs as a central perspective projection.
  - c) Explain the terms air base and flying height.

P.T.O.



3. Write short notes (**any two**) : **10**

- a) Pocket and mirror stereoscope
- b) Scale of an aerial photograph
- c) Normal colour and IR colour aerial photographs.

4. What is remote sensing ? Give an account of historical development of remote sensing.

OR

Give an account of visual interpretation key of an aerial photograph. **10**





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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**MICROBIOLOGY (Paper –I) (New Course)**  
**MB-331 : Medical Microbiology – I (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- N.B :** 1) *All questions are compulsory.*  
2) *All questions carry equal marks.*  
3) *Draw neat labelled diagram wherever necessary.*

1. A) Match the following :

5

[A]

[B]

- |   |                         |
|---|-------------------------|
| i) Carbohydrate Antigen of <u>Pneumococci</u>       | a) Weil-Felix reaction  |
| ii) Capsular hayluronic acid of <u>streptococci</u> | b) Tuberculin test      |
| iii) Purified protein derivative                    | c) VDRL test            |
| iv) Cardioliipin antigens                           | d) Synovial fluid       |
| v) Rickettsial antigens                             | e) 'C' reactive protein |

B) Attempt the following :

5

- i) Hepatitis B is transmitted through blood. State true or false
- ii) Define nephritis.
- iii) Name two common diseases of Respiratory system with causative agent
- iv) Enlist types of reservoirs of infection.
- v) Enlist types of cohert study.

P.T.O.



2. Write short notes on **any two** : **10**
- A) Gardner and Venkatraman classification of Vibrio.
  - B) Antigenic structure of Streptococcus.
  - C) Case control study.
3. Attempt **any two** : **10**
- A) Describe pathogenesis of Bacillus anthracis.
  - B) Explain defence mechanisms in female genital system.
  - C) Enlist common bacterial diseases of Gastrointestinal system with causative agents.
4. Attempt **any one** : **10**
- A) Describe toxins and virulence factors of Staphylococci.
  - B) Explain pathogenesis of Rickettsia.





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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**MICROBIOLOGY (Paper – II) (2008 Pattern) (New Course)**  
**MB – 332 : Genetics and Molecular Biology – I**

Time : 2 Hours

Max. Marks : 40

- N.B. :** 1) *All questions are compulsory.*  
2) *All questions carry equal marks.*  
3) *Draw neat labelled diagrams wherever necessary.*

I. Answer the following :

10

A) Choose the correct answer :

- i) Specificity in translation is obtained by all of the following except \_\_\_\_\_
- a) specific t RNA synthetase                      b) anticodon  
c) degenerate triplet code                      d) RNA polymerase
- ii) The process in which ribosomes are engaged is \_\_\_\_\_
- a) Replication                                      b) Transcription  
c) Translation                                      d) Disjunction
- iii) HMC is found in the DNA of \_\_\_\_\_
- a) Neurospora crassa                              b) Bacteriophage T<sub>4</sub>  
c) Escherichia coli                              d) Aspergillus nidulans
- iv) \_\_\_\_\_ protein is required for initiating the lytic pathway of  $\lambda$  bacteriophage.
- a) Cro protein                                      b) CII protein  
c) CI protein                                      d) Rho protein
- v) For the repair of damaged DNA \_\_\_\_\_ protein is required.
- a) Repressor protein                              b) Rec A protein  
c) Rho protein                                      d) Tus protein

P.T.O.



- I. B) i) Calculate the burst size if 2500 virions are liberated from 10 infected bacteria.
- ii) The sequence of bases on the coding strand is 3' C<sub>4</sub>C<sub>4</sub>TTGCATG5' .  
What will be the sequence of bases on the corresponding mRNA ?
- I. C) State whether the following statements are **True** or **False**.
- i) Ribosomes contain P and A sites for t RNA binding.
- ii) The I<sup>+</sup>P<sup>+</sup>O<sup>+</sup>Z<sup>+</sup>Y<sup>+</sup> genotype of E. coli does not synthesize β-galactosidase in presence of the inducer.
- iii) A thymine cap is added during the post transcriptional processing of procaryotic MRNA.
- II. Diagrammatically represent **any two** of the following : **10**
- i) Replication fork of DNA.
- ii) Positive control of Lac operon.
- iii) Excision repair of uv damaged DNA.
- III. Answer **any two** of the following : **10**
- i) Compare and contrast DNA polymerases.
- ii) Explain the role of Attenuation control in regulation of tryptophan operon.
- iii) Explain the Doerman's experiment with reference to intracellular development of lytic phage.
- IV. Answer **any one** of the following : **10**
- i) Explain the mapping of Neurospora crassa chromosomes by Tetrad analysis.
- ii) Explain in detail initiation, elongation and termination of transcription of procaryotic DNA.
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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**Paper – III : Microbiology (2008 Pattern) (New Course)**  
**MB – 333 : ENZYMOLOGY – I**

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) **All questions are compulsory.**  
2) **All questions carry equal marks.**  
3) Draw **neat** labelled diagrams **wherever** necessary.

1. Attempt the following. 10

- a) Define isotopes.
- b) 3D structure of proteins can be determined by \_\_\_\_\_
- c) The coenzyme form of nicotinic acid is \_\_\_\_\_
- d) Lineweaver Burk equation is given as  $\frac{1}{V} = \frac{K_m}{V_m} \frac{1}{[S]} + V_m$ . State True/False.
- e) In uncompetitive inhibition  $K_m$  increases and  $V_m$  decreases. State True/False.
- f) Active form of chymotrypsinogen is \_\_\_\_\_
- g) Location of ATP synthetase in bacterial cell is \_\_\_\_\_
- h) Define specific activity of an enzyme.
- i) Give two examples of materials used for column preparation in gel filtration.
- j) Define isoelectric point.

2. Attempt **any two**. 10

- a) Explain role of riboflavin as a coenzyme.
- b) Explain enzyme assay by spectro photometric method.
- c) Explain molecular exclusion chromatography.

P.T.O.



3. Attempt **any two**. **10**
- a) Explain use of ultracentrifugation for determination of molecular weight of proteins.
  - b) Explain immobilization of enzymes by covalent attachment with one example.
  - c) Explain any one method for purification of proteins based on solubility differences.
4. Derive equation for competitive inhibition. **10**

OR

Explain covalent modification with the example of glycogen phosphorylase.

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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**MICROBIOLOGY (Paper – IV)**  
**MB – 334 : Immunology – I**  
**(New) (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- N.B. :** 1) *All questions are compulsory.*  
2) *All questions carry equal marks.*  
3) *Draw neat labelled diagrams wherever necessary.*

1. A) Match the following and rewrite :

- |                    |                     |
|--------------------|---------------------|
| 1) Adjuvant        | A) Birbeck granules |
| 2) Dendritic cell  | B) Syphilis         |
| 3) Active immunity | C) Fraund           |
| 4) V.D.R.L.        | D) Toxoids          |
| 5) Macrophage      | E) Phagocytosis     |

B) State **true** or **false** :

- 1) Widal test is used for detection of thypus fever.
- 2) Antibody molecule possess two 'F<sub>c</sub>' loci.
- 3) Antigenic determinant site consists of 5-6 Amino-acids.
- 4) Maturation of stem cells in thymus produces B-lymphocytes.
- 5) Amino terminal domain of antibody molecule is used for complement attachment.

2. Write short notes on **any two** :

- A) -T- Lymphocytes
- B) Macrophages
- C) Hapten.

P.T.O.



3. Attempt **any two** :

A) Diagrammatically illustrate structure of 'lymph node'.

B) Counter immunoelectrophoresis (CIE).

C) RIA.

4. Describe light chain gene organization.

OR

Describe 'Immunofluorescence technique'.

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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**MICROBIOLOGY (Paper – V) (New Course)**  
**MB – 335 : Fermentation Technology – I (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- N.B :** 1) *All questions are **compulsory**.*  
2) *All questions carry **equal** marks.*  
3) *Draw **neat**, labelled diagram **wherever** necessary.*

1. A) Answer the following :

5

- i) Define revertants
- ii) Define patent
- iii) Define M.I.C.
- iv) Define Scale up.
- v) Ames' test is used to detect \_\_\_\_\_

B) Match the following :

5

**A**

**B**

- |                              |                             |
|------------------------------|-----------------------------|
| 1) Antifoam agent            | a) Response surface method  |
| 2) Biological assay          | b) Semiconductors           |
| 3) Media optimization        | c) Octadecanol              |
| 4) Thermistors               | d) Diffusion assay          |
| 5) Analogue resistant mutant | e) Gradient plate technique |

P.T.O.



2. Attempt **any two** of the following : **10**

- a) Describe the use of Plackett-Burman design in media optimization.
- b) Describe physico-mechanical methods of cell disruption.
- c) How the temperature is monitored in a fermentation process ?

3. Attempt **any two** of the following : **10**

- a) Describe the principles of validation with respect to pharmaceutical industry.
- b) How turbidometric assay is useful in quantitation of fermentation product.
- c) What is patent ? How the patentability of any pharmaceutical product is determined ?

4. Attempt **any one** of the following : **10**

- a) Describe in detail pyrogen test used for quality assurance of a finished product.
- b) How different expenditures for a fermentation are monitored to make it an economical process ?

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**T.Y. B.Sc. (Semester – III) Examination, 2012  
MICROBIOLOGY (Paper – VI) (New Course)  
MB – 336 : Food and Dairy Microbiology  
(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- N.B.:** i) **All questions are compulsory.**  
ii) **All questions carry equal marks.**  
iii) **Draw neat labelled diagrams wherever necessary.**

1. Answer the following : 10

- a) Define Asepsis.
- b) Define skimmed milk.
- c) Give the causative agent of stormy fermentation.
- d) Give the reagents used in phosphatase test.
- e) Name any two extrinsic factors affecting microbial growth of food.
- f) Define 'Z' value.
- g) Define starter culture.
- h) State the full form of HACCP.
- i) State the mechanism of action of sodium benzoate in food preservation.
- j) State **true** or **false** :  
Staphylococcus aureus is involved in food infection.

2. Attempt the following (**any two**) : 10

- a) Describe Brucella Ring test for microbial analysis of milk.
- b) Describe the role of salt and sugar in food preservation.
- c) Describe the spoilage of canned fruits.

P.T.O.



3. Attempt the following (**any two**) : **10**

- a) Explain starter cultures used in preparation of curd.
- b) Describe food infection due to vibrio with respect to source and prevention.
- c) Explain composition of milk.

4. Attempt **any one** of the following : **10**

- a) Define Pasteurisation. Explain any two methods of Pasteurisation.
- b) Describe clostrial food poisoning with respect to sources and prevention.

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T. Y. B.Sc. (Semester – III) Examination, 2012  
ELECTRONIC SCIENCE (Paper – III)

EL – 333 : Analog System Design and Applications of Linear IC's (New)  
(2008 Pattern)

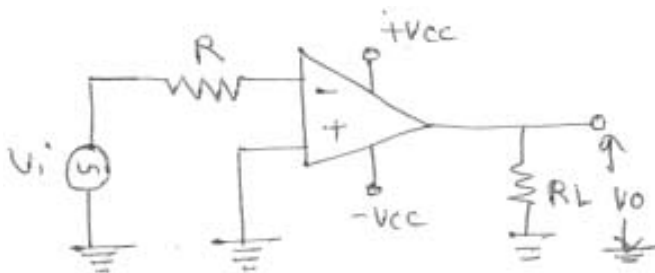
Time : 2 Hours

Max. Marks : 40

- N.B :** 1) *All questions are compulsory.*  
2) *Figures to right indicate full marks.*  
3) *Neat diagram must be drawn wherever necessary*

1. Attempt **all** of the following :

- |   |   |
|---|---|
| a) What are the advantages of guarding techniques ?   | 1 |
| b) List the basic types of Linear Ic packages.  | 1 |
| c) Define acquisition time of S/M circuit.  | 1 |
| d) State the application of differentiator.   | 1 |
| e) The Op-Amp Ic 741 is connected as inverting amplifier with gain of 10. What is the bandwidth ? | 2 |
| f) Give any four applications of V to F converter.  | 2 |
| g) Draw input and output waveform for the comparator.   | 2 |



- |  |   |
|--|---|
| h) State the limitations of log amplifier using diode. | 2 |
|--|---|



2. Answer **any two** of the following :

- a) Explain the working of astable multivibrator using timer IC 555. 4
- b) Draw and explain the circuit diagram for practical integrator. State its application. 4
- c) What is peak detector ? Draw the circuit diagram using OP-Amp. Write the charging and discharging condition for proper operation. 4

3. Answer **any two** of the following :

- a) Write a note on switched capacitor filter. 4
- b) Draw and explain the circuit diagram for adjustable voltage regulator using IC LM 317. 4
- c) With neat circuit diagram explain the designing steps for second order high pass Butterworth filter. 4

4. Answer **any two** of the following :

- a) Explain the working of log-amplifier using P-N junction diode. State its limitations. 6
- b) Draw and explain the circuit diagram of function generator using IC-8038. Write the important features of IC-8038. 6
- c) Describe the working of precision full wave rectifier using equal value resistors. Why it is called as absolute value circuit. State its performance limitation. 6

OR

4. Answer the following.

- a) Design voltage regulator using IC-723 for 5V and 800 mA. 4
- b) For VCO using IC-566 +  $V = 10V$ ,  $V_C = 9V$ ,  $C_1 = 0.001 \mu F$ , for frequency  $F_0 = 40 \text{ kHz}$ . Calculate the value of resistor  $R_1$ . 4
- c) In a monostable multivibrator using Op-AMP IC-741, calculate the time for quasistable state. Given  $R_1 = 1k\Omega$ ,  $R_2 = 10k\Omega$ ,  $C = 0.1 \mu F$  and  $R = 2.2k\Omega$ . 4



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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**ELECTRONIC SCIENCE (Paper – IV)**  
**EL – 334 : Foundations of Nanoelectronics**  
**(2008 Pattern) (New Course)**

Time : 2 Hours

Max. Marks : 40

- N.B :** 1) **All** questions are **compulsory**.  
2) **Neat** diagrams must be drawn **wherever** necessary.  
3) Figures to the **right** indicate **full** marks.  
4) Log table/ calculator is **allowed**.

Given : Mass of electron  $m = 9.11 \times 10^{-31} \text{ kg}$   
Plank's constant  $h = 6.625 \times 10^{-34} \text{ Js}$ .

1. Attempt **all** of the following :

- |   |   |
|---|---|
| a) What is Bottom up approach in nanoelectronics ?                | 1 |
| b) What do you mean by distribution function used in statistics ? | 1 |
| c) Define critical angle.   | 1 |
| d) State basic characteristics of flash memory.                   | 1 |
| e) Explain Heisenberg's uncertainty principle.                    | 2 |
| f) What is Fermi energy ?   | 2 |
| g) State Poynting vector theorem.                                 | 2 |
| h) What is tunneling effect ?                                     | 2 |

2. Attempt **any two** of the following :

- |   |   |
|---|---|
| a) Explain motion of an electron in square well potential of finite depth.  | 4 |
| b) Explain Maxwell-Boltzmann distribution.  | 4 |
| c) Obtain an expression for reflection coefficient with normal incidence of plane wave at the boundary of two non-conducting media. | 4 |

P.T.O.



3. Attempt **any two** of the following :

- a) What is density of states ? Explain density of states of electrons in nano structure. 4
- b) What is skin depth ? Obtain an expression for skin depth. 4
- c) Describe the resonant tunneling diode with its constructional diagram. 4

4. Attempt **any two** of the following :

- a) What is quantum wire ? Explain electron transport in quantum wire. 6
- b) What is Hall effect ? Obtain an expression for Hall voltage in semi conductor. 6
- c) i) Explain concept of atomic orbital. 3  
ii) Explain wave particle duality. 3

OR

Answer **all** of the following :

- a) Calculate de-Broglie wavelength of an electron moving with speed of  $1/10^{\text{th}}$  of velocity of light. 4
- b) Determine the probability that an energy level  $3 kT$  above the Fermi energy is occupied by an electron for  $T = 300 \text{ K}$ . 4
- c) The EM wave is incident obliquely at the boundary of two medium having refractive indices 3 and 6 respectively, calculate Brewster angle. 4



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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**ELECTRONIC SCIENCE (Paper – V)**  
**EL – 335 : ‘C’ Programming**  
**(New) (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) **All** questions are **compulsory**.  
2) **Neat** diagrams must be drawn **wherever** necessary.  
3) Figures to the **right** indicate **full** marks.  
4) Use of calculator is **allowed**.

1. Answer **all** of the following :

- |  |   |
|--|---|
| a) List the short-hand assignment operators in C.                  | 1 |
| b) What is a library function ?                                    | 1 |
| c) Define a pointer in C.  | 1 |
| d) How is a structure declared ?                                   | 1 |
| e) What are keywords ?   | 2 |
| f) State the difference between an ordinary variable and an array. | 2 |
| g) Give the general format for declaring and opening a data file.  | 2 |
| h) Define : i) Pixel ii) Resolution.                               | 2 |

2. Answer **any two** of the following :

- |   |   |
|---|---|
| a) What is a loop ? Explain while loop in C.  | 4 |
| b) Explain call by value and call by reference.                                     | 4 |
| c) Explain with a suitable example, the declaration and initialization of 2D array. | 4 |

P.T.O.



3. Answer **any two** of the following :

- a) List different types of decision making statements and explain if ... else statement. 4
- b) Explain fprintf ( ) fscanf ( ) functions with suitable examples. 4
- c) Give the syntax of the following graphics functions : 4
  - i) initgraph ( )
  - ii) circle ( )
  - iii) rectangle ( )
  - iv) line ( ).

4. Answer **any two** of the following :

- a) Explain the following functions : 6
  - i) scanf ( )
  - ii) putchar ( )
  - iii) getchar ( ).
- b) What is a recursion ? Write a C program to calculate sum of digits of an integer using a recursion. 6
- c) Explain the purpose of each of the following declarations : 6
  - i) int p (char a) ;
  - ii) int \*p (char a) ;
  - iii) int \*p ;
  - iv) int p [10];

OR

4. Answer **all** of the following :

- a) Write a C program for the multiplication of two 4×4 matrices. 4
- b) Write a C program to copy the contents of one data file into another. 4
- c) Write a C program to draw electronic circuit symbols of capacitor and diode using graphics mode. 4





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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**ELECTRONIC SCIENCE (Paper – VI) (Optional) (Ele. – I)**  
**EL336 – A : Fiber Optics and Fiber Optics Communication**  
**(New) (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- N.B. :** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*  
3) *Draw labelled diagram wherever necessary.*

1. Attempt **all** of the following :

- a) Define channel capacity. (1)
- b) List various optical detectors. (1)
- c) What are the ways in which power transfer takes place in optical fiber couplers ? (1)
- d) What are different areas where optical fiber links are used ? (1)
- e) Draw block diagram of optical fiber communication system. (2)
- f) Calculate acceptance angle of an optical fiber having  $NA = 0.394$ . (2)
- g) What are the requirement of optical detector ? (2)
- h) Write the equation for power loss in optical fiber. (2)

2. Attempt **any two** of the following :

- a) Explain the role of optical fiber in telephony. (4)
- b) Write a note on classification of optical fibers. (4)
- c) With suitable diagram explain the mechanism of detection of light in pn detector. (4)

P.T.O.



3. Attempt **any two** of the following :

- a) With neat diagram explain the role of strength member in optical fiber cable. **(4)**
- b) Explain loss in optical fiber link due to misalignment and joint. **(4)**
- c) Explain the role of repeaters in optical fiber communication system. **(4)**

4. Attempt **any two** of the following :

- a) With neat diagram explain fabrication of optical fiber cable using axial vapour deposition method. **(6)**
  - b) Discuss the essential characteristics of long haul optical fiber link. **(6)**
  - c) Discuss the advantages and disadvantages of optical fiber in computer networking. **(6)**
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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**ELECTRONIC SCIENCE (Paper – VI) (Ele. I)**  
**EL336 – B : Sensors and Actuators**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- Notes :** i) *All questions are compulsory.*  
ii) *Neat diagrams must be drawn wherever necessary.*  
iii) *Figures to the right indicate full marks.*

1. Attempt **all** of the following :

- a) List four static characteristics of sensor. (1)
- b) What is solenoid ? (1)
- c) Define filter. (1)
- d) What do you mean by MEMS ? (1)
- e) “Cold junction compensation is required in thermocouple”. – Comment. (2)
- f) What is stepper motor ? State its applications. (2)
- g) Write advantages of active filter over passive filter. (2)
- h) State the difference between thin film and thick film sensors. (2)

2. Attempt **any two** of the following :

- a) Discuss classification of sensors on the basis of energy or power supply requirement. (4)
- b) With neat diagram explain the working of electromagnetic flow meter. (4)
- c) State different sensors used in automobile applications. Explain any one of them. (4)



3. Attempt **any two** of the following :

- a) State the types of photo detectors. Explain the construction and working of LDR. **(4)**
- b) Draw block diagram of smart sensor system. State important properties of such system. **(4)**
- c) What are different sensors used in industrial applications ? Write note on temperature sensors used in industry. **(4)**

4. Attempt **any two** of the following :

- a) Explain the operation of an LVDT for measurement of displacement. How is its output depends on the position of core. **(6)**
- b) With neat diagram explain the construction and working of DC motor. List its specifications. **(6)**
- c) Design first order active high pass filter with cut off frequency 5 KHz and gain 4. Draw the circuit diagram and frequency response curve for the same. **(6)**

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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**DEFENCE AND STRATEGIC STUDIES**  
**DS – 331 – Science, Technology and National Security**  
**(2008 Pattern) (Paper – I)**

Time : 2 Hours

Max. Marks : 40

**N.B. :** i) *All questions are **compulsory**.*  
ii) *Figures to the **right** indicate marks.*

1. Answer in **2 to 4** sentences **each**. **16**
  - 1) Define 'Science'.
  - 2) Define 'Technology'.
  - 3) Define 'National Security'.
  - 4) What is 'Electronic Warfare' ?
  - 5) What is 'space warfare' ?
  - 6) What is ECCM ?
  - 7) Introduce RMA
  - 8) What is Military Technology ?
  
2. Answer in **8 to 10** sentences (**any two**). **8**
  - 1) Develop relationship between science and technology.
  - 2) Write the military application of information technology.
  - 3) Make an evolution of science and technology.
  
3. Write short notes on (**any two**). **8**
  - 1) New military technologies.
  - 2) Trends in Defence Materials.
  - 3) Industrial Revolution.
  
4. Answer in **16 to 20** sentences (**any one**). **8**
  - 1) Discuss the role of science and technology in National security.
  - 2) Discuss the military applications of Space Borne Assets.



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**T.Y.B.Sc. (Semester – III) Examination, 2012**  
**DEFENCE AND STRATEGIC STUDIES (Paper – III)**  
**DS-333 : Study of Disaster**  
**(2008 Pattern)**

Time: 2 Hours

Max. Marks : 40

***Instructions :*** 1) ***All questions are compulsory.***

2) ***Figures to the right indicate marks.***

1. Answer in **two to four** sentences :

**16**

- 1) Define Disaster.
- 2) Write any two characteristic of Natural Disaster.
- 3) What do you mean by Pollution ?
- 4) Define Earthquake.
- 5) Define Terrorism.
- 6) What do you mean by Manmade Disaster ?
- 7) Define Chemical War.
- 8) Define War.

2. Answer in eight to **ten** sentences (**any two**) :

**8**

- 1) Discuss the effects of war.
- 2) Explain the types of Environmental Disaster.
- 3) Explain Medical Alteration.

P.T.O.



3. Write short notes on (**any two**) : **8**
- 1) Biological War.
  - 2) Tsunami.
  - 3) Population Burden.
4. Answer in **8 to ten** sentences (**any two**) : **8**
- 1) Discuss the characteristic and effects of Manmade Disaster.
  - 2) Write an essay on Nuclear War.



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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**Defence and Strategic Studies (Paper – IV)**  
**DS-334 : RESEARCH METHODOLOGY**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

**N.B :** i) *All questions are compulsory.*  
ii) *Figures to the right indicate full marks.*

1. Answer in **2 to 4** sentences **each** : **16**
  - 1) Define 'Action Research'.
  - 2) Define 'Qualitative Data'.
  - 3) What is 'Questionnaire' ?
  - 4) Define 'Sample'.
  - 5) Define 'Generalisation'.
  - 6) What is 'Research Methods' ?
  - 7) What is 'Scientific approach' ?
  - 8) Define 'Social Sciences'.
2. Answer in **8 to 10** sentences (**any two**) : **8**
  - 1) Explain the aims and objective of research.
  - 2) Write the advantages of research.
  - 3) Write the characteristics of research.
3. Write short notes on (**any two**) : **8**
  - 1) Research report
  - 2) Hypothesis
  - 3) Research design.
4. Answer in **16 to 20** sentences (**any one**) : **8**
  - 1) Explain the scope of research in the subject 'Defence and Strategic Studies'.
  - 2) Explain the methods of data collection.







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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**Defence and Strategic Studies (Paper – V)**  
**DS – 335 : COMPUTER APPLICATIONS IN DEFENCE MANAGEMENT**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

**Instructions :** 1) **All the questions are compulsory.**  
2) **Figures to the right indicate full marks.**

1. Answer in **two to four** sentences : **16**
  - 1) Management of Defence means what ?
  - 2) What do you understand by C4 ?
  - 3) Define Operational Research.
  - 4) What is Flowchart ?
  - 5) Give full form of CAD.
  - 6) What is Auxiliary Storage ?
  - 7) List the features of Algorithm.
  - 8) Data Representation means what ?
2. Answer in **8 to 10** sentences (**any two**) : **8**
  - 1) Explain the importance of Scientific Approach in Defence Management.
  - 2) Explain Hybrid Computers.
  - 3) Discuss the contribution of Computer Application in Defence Management.
3. Write short notes on (**any two**) : **8**
  - 1) Types of data Transmission.
  - 2) CAM.
  - 3) "Generation" of Computers.
4. Answer in **16 to 20** sentences (**any one**) : **8**
  - 1) Do you think computer application in defence management is necessary ?  
Justify your answer.
  - 2) Discuss the various scientific approaches in defence management.



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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**DEFENCE AND STRATEGIC STUDIES (Paper – VI) (Optional)**  
**DS – 336(A) : Indian Military System – I (Ele. – I)**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

**N.B :** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*

1. Answer in **2** or **4** sentences **each**. **16**
  - 1) Define “Military History”.
  - 2) What was the basic reason for “Battle of Terrian” ?
  - 3) State the meaning of Rajput.
  - 4) Who was Angad ?
  - 5) When and between whom the battle of Jhelum it was fought ?
  - 6) State the duration of Rajputs.
  - 7) Why and between whom the batttle of Tenking it was fought ?
  - 8) What do you know about Sudas ?
2. Answer in **8** or **10** sentences (**any two**). **8**
  - 1) Distinguish between General History and Military History.
  - 2) What were the demerits of Rajputs ?
  - 3) Write in brief about “Fort of Bhatinda”.
3. Write short notes on (**any two**). **8**
  - 1) Difference between defence and security.
  - 2) Art of war during Vedic period.
  - 3) Any two sources of Indian Military History.
4. Answer in **16** to **20** sentences (**any one**). **8**
  - 1) Analyse the battle of Jhelum with special, reference to the “Applications and principles of war” by Alexander.
  - 2) Write an essay on Kautilya as a “Military Thinker”.

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P.T.O.



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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**DEFENCE AND STRATEGIC STUDIES (Paper – VI) (Optional)**  
**DS – 336(B) : Maratha Military System – I**  
**(2008 Pattern) (Ele. – I)**

Time : 2 Hours

Max. Marks : 40

**N.B :** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*

1. Answer in **2** or **4** sentences **each**. **16**
    - 1) When and where Shivaji was born ?
    - 2) State any two saints of Maharashtra during Shivaji's time ?
    - 3) What was the Grand strategy of Shivaji ?
    - 4) What do you know about Chandra Rao More ?
    - 5) State any two political powers of contemporary Maharashtra.
    - 6) What do you know about Murar Baji ?
    - 7) State the meaning of Paga.
    - 8) What was the basic aim of Shivaji's Karnataka Campaign ?
  2. Answer in **8** or **10** sentences (**any two**). **8**
    - 1) Write few lines on "Discipline" expected by Shivaji.
    - 2) Explain geographical condition of Maharashtra before Shivaji.
    - 3) What were the gains for Shivaji from conquest of Jawali.
  3. Write short notes on (**any two**). **8**
    - 1) Childhood of Shivaji.
    - 2) Forts of Shivaji.
    - 3) Strategy of Shivaji.
  4. Answer in **16** to **20** sentences (**any one**). **8**
    - 1) Explain the Battle of Pratapgad with special reference to the principle of war.
    - 2) Discuss the terms and condition of Treaty of Purandar and highlight on how it was great setback for Shivaji ?
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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**DEFENCE AND STRATEGIC STUDIES (Paper – VI) (Optional)**  
**DS – 336(C) : Indian War since Independence – I**  
**(2008 Pattern) (Ele. – I)**

Time : 2 Hours

Max. Marks : 40

**N.B :** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*

1. Answer in **2** or **4** sentences **each**. **16**
  - 1) Why the partition took place between India and Pakistan ?
  - 2) Which tanks it was supplied by USA to Pak during 1964-65 ?
  - 3) Why Pakistan attacked on “Kashmir” during Oct. 1947 ?
  - 4) What do you mean by ceasefire ?
  - 5) When Indo-Pak war of 1947-48 came to an end ?
  - 6) What do you mean by “Forward policy of India” during 1959 to 1962 ?
  - 7) Why Kashmir it was merged with India by Raje Hari Singh ?
  - 8) Write the basic reason for Indo-Pak war of 1965.
2. Answer in **8** or **10** sentences (**any two**). **8**
  - 1) Explain in brief Pakistan’s stand on Kashmir issue.
  - 2) Discuss in short Chinese encroachment in Aksai-Chin during 1962.
  - 3) Write in brief the nature of Sino-Indian border dispute.
3. Write short notes on (**any two**). **8**
  - 1) Indias stand on Kashmir issue.
  - 2) Impact of 1947-48 war on India and Pakistan relations.
  - 3) Tashkant Agreement of 1965.
4. Answer in **16** to **20** sentences (**any one**). **8**
  - 1) Expalin in detail the “complications of Kashmir issue”.
  - 2) Describe the Chinese offensive during 1959 to 1962 with special reference to.





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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**DEFENCE AND STRATEGIC STUDIES (Paper – VIII)**  
**DS – 338 (A) : Armed Conflict and Human Rights**  
**(2008 Pattern) (Ele.-III)**

Time : 2 Hours

Max. Marks : 40

**N.B. :** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*

1. Answer in **2 to 4** sentences each. **16**
  - a) What do you understand by Human Rights ?
  - b) What is meant by Non-combatant ?
  - c) Give the two symbols of ICRC organization.
  - d) Who founded ICRC ?
  - e) What to you mean by defenseless victims ?
  - f) Write full form of UDHR
  - g) Write concept of unarmed conflict.
  - h) State the concept of Combatant.
  
2. Answer in **8 to 10** sentences (**any 2**) : **8**
  - a) Comment on Developments in Human Rights.
  - b) Examine the protection of wounded and sick soldiers in an unarmed conflict.
  - c) Write in brief on ICESCR.
  
3. Write short notes on (**any 2**) : **8**
  - a) Explain the position of Human Rights on the issues of development and democracy.
  - b) Comment on Laws of armed conflicts in African countries.
  - c) What are the issues of human rights at the global level ?
  
4. Answer in **16 to 20** sentences (**any one**) : **8**
  - a) Discuss the need to have international humanitarian law and cite some examples to it.
  - b) Evaluate the role of international agencies in protection of human rights in developing countries.

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P.T.O.



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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**DEFENCE AND STRATEGIC STUDIES (Paper – VIII)**  
**DS – 338 (B) : International Organizations and National Security**  
**(2008 Pattern) (Ele.-III)**

Time : 2 Hours

Max. Marks : 40

**N.B. :** 1) *All questions are compulsory.*  
 2) *Figures to the right indicate full marks.*

1. Answer in **2 to 4** sentences each. **16**
    - a) What do you understand by sovereignty ?
    - b) What is meant by Peace keeping ?
    - c) How many members are there in United Nations ?
    - d) When did World War I began ?
    - e) Define Veto Power.
    - f) State the principle organs of United Nations.
    - g) Write full form of UNESCO and UNICEF.
    - h) When was treaty of Versailles signed ?
  
  2. Answer in **8 to 10** sentences (**any 2**) : **8**
    - a) Comment on Wilson's fourteen point programme.
    - b) Examine the working of UN Security council in Maintenance of International Peace and security.
    - c) Examine the achievements of League of Nations.
  
  3. Write short notes on (**any 2**) : **8**
    - a) Write in brief on the evolution of League of Nations.
    - b) Analyze the working of principle organs of UN.
    - c) Explain the structure of League of Nations.
  
  4. Answer in **16 to 20** sentences (**any one**) : **8**
    - a) Discuss the various peace keeping attempts that have been made by the UN, since its birth.
    - b) Do you think a reform of the UN is need ? Argue.
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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**DEFENCE AND STRATEGIC STUDIES (Paper – VIII)**  
**DS – 338 (C) : International Law (Optional)**  
**(2008 Pattern) (Ele.-III)**

Time : 2 Hours

Max. Marks : 40

**N.B. :** 1) *All questions are compulsory.*  
2) *Figures to the right indicate marks.*

1. Answer in **two** to **four** sentences. **16**
  - 1) State the meaning of Universal Law.
  - 2) Write any two basis of International Law.
  - 3) Define world order.
  - 4) Write any two functions of U.N. O.
  - 5) Define Treaties.
  - 6) Define CBW (Chemical, Biological warfare).
  - 7) State the meaning of Diplomacy.
  - 8) Define Human Rights.
  
2. Answer in **8** to **10** sentences (**any 2**) : **8**
  - 1) Explain Nature of International Law.
  - 2) Discuss role of U.N. in Human Rights.
  - 3) Describe features of Geneva conventions.
  
3. Write short notes on (**any two**) : **8**
  - 1) Sources of International Law.
  - 2) History of codification.
  - 3) War crimes.
  
4. Answer in **16** to **20** sentences (**any one**) : **8**
  - 1) Explain role of U.N. in world peace keeping.
  - 2) Discuss structure of U.N.O.





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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**DEFENCE AND STRATEGIC STUDIES (Paper – IX)**  
**DS – 339 (A) : Defence Management in India (Optional)**  
**(2008 Pattern) (Ele. – IV)**

Time : 2 Hours

Max. Marks : 40

**N.B. :** i) *All questions are compulsory.*  
ii) *Figures to the right indicate full marks.*

1. Answer in **2 to 4** sentences **each** : **16**
  - 1) What is H.R. ?
  - 2) Define 'Defence'.
  - 3) Define 'Management'.
  - 4) What is 'Corporate' ?
  - 5) What is 'Controlling' ?
  - 6) What is 'Esprit-de-corps' ?
  - 7) What is 'Organisational goal' ?
  - 8) What is 'Team Building' ?
2. Answer in **8 to 10** sentences (**any two**) : **8**
  - 1) Explain why management is essential to defence.
  - 2) Write the salient features of management.
  - 3) How Team building is accomplished ?
3. Write short notes on (**any two**) : **8**
  - 1) Leadership.
  - 2) War Principles.
  - 3) Concept of Management.
4. Answer in **16 to 20** sentences (**any one**) : **8**
  - 1) Write an essay on HR management in Armed Forces.
  - 2) Explain any five principles of Fayol's Management.

P.T.O.



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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**DEFENCE AND STRATEGIC STUDIES (Paper – IX)**  
**DS – 339 (B) : Internal Security of India (Optional)**  
**(2008 Pattern) (Ele. – IV)**

Time : 2 Hours

Max. Marks : 40

**N.B. :** i) *All questions are compulsory.*  
ii) *Figures to the right indicate full marks.*

1. Answer in **2** or **4** sentences **each** : **16**
    - 1) Define 'Internal Security'.
    - 2) State the meaning of "Naxalism".
    - 3) What do you mean by ULFA ?
    - 4) How many Indian State being affected by Naxalite Movement ?
    - 5) State any two internal security challenges to India.
    - 6) What do you know about "Seven Sister" of India's North-East region ?
    - 7) Which countries having physical contiguity with India ?
    - 8) What do you mean by Non State Actors ?
  2. Answer in **8** or **10** sentences (**any two**) : **8**
    - 1) Write in brief "Bottle Neck of India".
    - 2) Explain in brief any one element of state.
    - 3) Write in short concept of "Religious Fundamentalist".
  3. Write short notes on (**any two**) : **8**
    - 1) S.E.Z.
    - 2) N.D.F.B.
    - 3) Kashmir : As a Internal security problem.
  4. Answer in **16** to **20** sentences (**any one**) : **8**
    - 1) Explain in detail the Socio-ethnic and economic dimensions of internal security problem of Indias North-East region.
    - 2) How "Naxalite problem" is a serious challenge to India's internal security ? Discuss.
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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**DEFENCE AND STRATEGIC STUDIES (Paper – IX)**  
**DS – 339 (C) : India's Maritime Security – I**  
**(2008 Pattern) (Ele. – IV)**

Time : 2 Hours

Max. Marks : 40

**N.B. :** i) *All questions are compulsory.*  
ii) *Figures to the right indicate marks.*

1. Answer in **two to four** sentences **each** : **16**
  - 1) State the meaning of Maritime Environment.
  - 2) Define Territorial Sea.
  - 3) State the meaning of continental shelf.
  - 4) Write the meaning of Maritime Fixed Assets.
  - 5) Define Maritime Threats.
  - 6) Write the meaning of Maritime Military Strategy.
  - 7) State any two functions of the coast guard.
  - 8) What do you mean by Maritime Defence.
  
2. Answer in **8 to 10** sentences (**any two**) : **8**
  - 1) Write brief history of oceans.
  - 2) Explain Naval Bases of India.
  - 3) Discuss role of Coast Guard during war.
  
3. Write short note on (**any two**) : **8**
  - 1) Merchant Navy and its role.
  - 2) Exclusive Economic Zone (EEZ).
  - 3) Rights and duties of the coastal state.
  
4. Answer in **16 to 20** sentences (**any one**) : **8**
  - 1) Write an Essay on the dimensions of Maritime Security of India.
  - 2) Explain India's Maritime military strategy'.





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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**ENVIRONMENTAL SCIENCES (Paper – I)**  
**New Course**  
**ENV 331 : Terrestrial Ecosystems and Management**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- Instructions :**
- 1) **All** questions are **compulsory**.
  - 2) Neat and labeled diagrams must be drawn wherever necessary.
  - 3) Figures to the **right** indicate **full** marks.

1. Attempt the following in **1-2** lines **each** : **10**
- a) Name any two hotspots in India.
  - b) Define Keystone species.
  - c) What is commensalism ?
  - d) Define bio-geochemical cycle.
  - e) What is habitat restoration ?
  - f) Define Remote sensing.
  - g) What is chaparral ?
  - h) Write two example of habitat restoration.
  - i) What is meant by sustainable use of resources ?
  - j) Define biotic community with one example.

P.T.O.



2. Write a short note on (**any two**) : **10**
- a) Vegetation sampling by quadrat method.
  - b) Desert biome
  - c) Chipko movement.
3. Answer **any two** from the following : **10**
- a) Discuss the reasons and effects of forest fire.
  - b) Explain community based forest management in Orissa.
  - c) Explain concept of ecotone with reference to edge effect.
4. Attempt **any one** from the following : **10**
- a) Explain the types of interactions between the species with examples.
  - b) Explain carbon and nitrogen cycle.

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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**ENVIRONMENTAL SCIENCES (Paper – II)**  
**ENV-332 : Wildlife Biology**  
**(2008 Pattern) (New Course)**

Time : 2 Hours

Max. Marks : 40

**Instructions :** 1) *All questions are compulsory.*

2) *Neat and labelled diagrams must be drawn wherever necessary.*

3) *Figures to the right indicate full marks.*

1. Attempt the following in **1-2** lines **each** : **10**
- a) Define 'Wildlife', according to the Wildlife Protection Act 1972.
  - b) Name any 2 biodiversity hotspot of the world.
  - c) Enumerate any 2 characteristics of insects.
  - d) Enumerate any 2 characteristics of angiosperms.
  - e) Write 2 examples of food chain in a grassland ecosystem.
  - f) What is meant by brackish water ecosystem ? Give example.
  - g) Enlist any 2 examples of hot desert.
  - h) Enumerate any 2 economic importance of birds.
  - i) What are halophytic algae ?
  - j) Define urbanisation.
2. Write a short note on **(any two)** : **10**
- a) Point centre method.
  - b) Camera trapping.
  - c) Wetlands.

P.T.O.



3. Answer **any two** from the following : **10**

- a) Discuss the various reasons for biodiversity formation.
- b) What is meant by Human-wildlife conflict ? Explain with 2 examples.
- c) Discuss Quadrat method with respect to its shape, size, types and numbers.

4. Attempt **any one** of the following : **10**

- a) Describe in detail any 5 major terrestrial habitats. Give examples for each.
- b) Describe the characteristics of any 5 plant groups and their respective habitat type.

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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**ENVIRONMENTAL SCIENCES (Paper – III)**  
**(New Course)**  
**ENV – 333 : Water Quality**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) **All** questions are **compulsory**.  
2) **Neat** and labeled diagrams must be drawn **wherever** necessary.  
3) Figures to the **right** indicate **full** marks.

1. Attempt the following in **1 - 2** lines **each** : **10**
- a) Name any 2 water borne diseases caused by virus.
  - b) What is COD ? Mention its permissible limit.
  - c) Define : Marine pollution.
  - d) Give the permissible limit of Arsenic in water according to WHO.
  - e) What is meant by vector ?
  - f) Define : Eutrophication.
  - g) What is estuary ?
  - h) What are Builders ?
  - i) Define the term : Emulsification.
  - j) State the difference between Point and Non-point pollution source with example.
2. Write a short note on (**any two**) : **10**
- a) Water cycle with diagram.
  - b) Role of science and policy in solving water problems.
  - c) Classification of water pollutants on the basis of characteristics.

P.T.O.



3. Answer **any two** from the following : **10**

- a) Describe the various sources and uses of water. Give water inventory.
- b) Explain any 5 harmful effects of thermal water pollution.
- c) Give detailed classification of detergents with examples.

4. Attempt **any one** of the following : **10**

- a) Describe lake pollution with reference to its sources and effects. Add a note on its case study.
- b) Describe the analysis methods of water for any 3 Physical and any 2 Chemical parameters.

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**T.Y. B.Sc. (Semester – III) Examination, 2012  
ENVIRONMENTAL SCIENCES (Paper – IV)  
ENV-334 : Issues in Environmental Sciences  
(New Course) (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- Instructions :**
- 1) **All questions are compulsory.**
  - 2) **Neat and labeled diagrams must be drawn wherever necessary.**
  - 3) **Figures to the right indicate full marks.**

1. Attempt the following in **1-2** lines each : **10**
  - a) Define CDM.
  - b) Name any two NGO's working in environmental conservation.
  - c) What is environmentalism ?
  - d) Enlist important Green House Gases.
  - e) What do you mean by carbon credits ?
  - f) Define pastoralism.
  - g) Enlist any two reasons of food crisis.
  - h) Write the significance of green revolution.
  - i) Name any two important environmental movements.
  - j) What is rehabilitation of degraded lands ?
  
2. Write a short note on (**any two**) : **10**
  - a) Genetically Modified organisms.
  - b) Outcome of copenhagen.
  - c) Carbon sequestration.



3. Answer **any two** from the following : **10**

- a) What are bioresources ? Discuss their impact on local economy.
- b) Explain how the political economy affects environment management.
- c) Discuss the significance of life cycle assessment.

4. Attempt **any one** of the following : **10**

- a) Elaborate on the impact of global warming on agriculture, human health and biological diversity.
- b) What is sustainable development ? Mention its objectives and any two international conventions aiming sustainable development.

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**T.Y. B.Sc. (Semester – III) Examination, 2012  
INDUSTRIAL CHEMISTRY (Paper – V)  
Industrial Methods of Chemical Analysis  
(Vocational Course) (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- N.B. :** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*  
3) *Neat diagrams must be drawn wherever necessary.*  
4) *Use of calculator/Logarithmic table is allowed.*  
5) *Assume suitable additional data if necessary.*

1. Answer precisely the following : 10
- Write the Ilkovic equation.
  - State the origin of residual current in polarography.
  - Why are single crystals used for diffraction of X-rays ?
  - State the principle of normal pulse polarography.
  - What is an absorptive edge ?
  - Define soft method of ionization.
  - What is the temperature of acetylene-oxygen flame ?
  - Why do free neutrons not exist ?
  - Why are ion-selective electrodes referred to as Plon electrodes ?
  - Name two detectors in mass spectrometry.
2. A) Answer **any two** of the following : 6
- Explain oxygen interference' in polarography.
  - Draw a neat labelled diagram of an X-ray fluorescence apparatus.
  - State the properties of ion-selective membranes.

P.T.O.



B) Answer briefly **any two** of the following : 4

a) Define the terms used in polarography. :

i) decomposition potential and

ii) half-wave potential.

b) Write the advantages of total consumption burner.

c) Calculate the number of dynodes in a PM tube in AAS having amplification factor 250 and each dynode emitting 6 electrons.

3. Answer **any two** of the following : 10

a) Describe with a neat labelled diagram the construction and working of a hollow cathode lamp used in AAS.

b) A time of flight mass spectrometer has a flight path of 50.0 cm and accelerating potential of 1250 V. What is the time required for ionic fragments with  $\frac{m}{z} = 50$  to strike the detector ?

c) Determine the capillary characteristics of a capillary at a potential of – 0.6 V with respect to calomel if 100 drops of mercury weigh 490 mg and the time of formation of 10 drops is 45 sec.

4. A) Describe the technique of hydrodynamic voltammetry. 6

OR

A) Discuss electron bombardment ionization method used in mass spectrometry. 6

B) Answer **any one** of the following : 4

a) Derive Bragg's equation used in an X-ray diffraction technique.

b) State the principle of neutron diffraction analysis and give its applications.

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**T.Y. B.Sc. (Semester – III) Examination, 2012  
BIOTECHNOLOGY (Vocational)  
Plant Biotechnology (Paper – V)  
(Voc. Biotech.335) (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- Instructions:**
- 1) *All questions are **compulsory**.*
  - 2) *Black figures to the **right** indicate **full** marks.*
  - 3) *Draw neat diagrams **wherever** necessary.*

1. Answer **each** of the following. **10**
- a) Give one limitation of secondary metabolites production.
  - b) Give one advantage of somaclonal variation.
  - c) Define plant tissue culture.
  - d) What are the types of artificial seeds ?
  - e) What is bioforming ?
  - f) What is ex-situ conservation of germplasm ?
  - g) Give one example of endangered plant species.
  - h) What is anther culture ?
  - i) Enlist the physical methods of gene transfer in plants.
  - j) Define haploids.

P.T.O.



2. Answer **any two** of the following : **10**

- a) What is somaclonal variation ? What are the causes of somaclonal variation ?
- b) Define secondary metabolites. Explain the production of secondary metabolites.
- c) Comment on micropropagation of medicinal plants.

3. Write short notes on **any two** of the following : **10**

- a) Somatic embryogenesis
- b) Transgenic plants
- c) Cryopreservation

4. What is ovule culture ? Discuss the uses of haploids in plant breeding. **10**

OR

What is gene transfer. Discuss the biological methods of gene transfer in plants.

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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**PHOTOGRAPHY AND AUDIO VISUAL PRODUCTION (Vocational)**  
**Paper – V : Video Recording and Playback Systems**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- Instructions :**
- 1) *All questions are compulsory.*
  - 2) *Draw neat and labeled diagrams wherever necessary.*
  - 3) *Figures to the right indicate full marks.*

1. Answer the following : **10**
- a) State the bandwidths of audio and TV video signals.
  - b) State any two TV camera adjustments.
  - c) State the advantages of a video tape over motion picture film.
  - d) State the primary colours used in colour TV systems.
  - e) Explain the terms trace and retrace.
  - f) How is an ACD replayed ?
  - g) What is the use of dichroic mirrors in colour TV camera ?
  - h) What is the function of 'Colour Killer' circuit ?
  - i) State application area of magnetic video disc machine.
  - j) What is meant by helical scan ?
2. Answer **any two** of the following : **10**
- a) What is the need for scanning ? Explain one complete frame of odd line interlaced scanning used in India.
  - b) Explain the PAL colour signal.
  - c) Give the construction and working of vidicon camera tube.

P.T.O.



3. Answer **any two** of the following : **10**

- a) Describe the optical pick up system used in a CD player.
- b) What is meant by CCD ? Explain its construction and working. State its applications.
- c) Explain, with a block diagram, working of magnetic video disc machine.

4. Answer **any one** of the following : **10**

- a) Give the block diagram of B/W TV receiver. Explain the working of tuner section.
- b) I) Explain the record electronics in a VCR.  
II) Explain the construction and working of a colour picture tube.

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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**ELECTRONIC EQUIPMENT AND MAINTENANCE**  
**(Vocational) (Paper – V)**  
**Electronic Equipment Troubleshooting and Repairs**  
**(New Course) (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*  
3) *Use of Log tables, calculators is allowed.*

1. Answer the following :

- a) State the importance of circuit diagrams in the troubleshooting process. 1
- b) State any two types of failures in electronic equipment. 1
- c) What is possible fault if output of digital circuit is always low ? 1
- d) How will you identify terminals of transistor ? 1
- e) State advantages of SMPS over linear regulator. 2
- f) State common faults in an Inductor. 2
- g) Physical inspection of equipment is necessary before its maintenance –  
Comment. 2
- h) Service Engineer should take user's report about the faulty equipment –  
Comment. 2

2. Answer **any two** of the following :

- a) Explain various steps required in systematic troubleshooting of electronic equipment. 4
- b) Name typical faults in a capacitor and mention their causes. 4
- c) What are the common faults in transformer ? Mention their causes. 4

P.T.O.



3. Answer **any two** of the following :
- a) Explain typical faults in rectifier circuit. 4
  - b) Describe the troubleshooting of microcontroller based instrument. 4
  - c) Explain the working of following digital test and service instrument. 4
    - i) Logic probe
    - ii) Logic comparator
4. Answer **any two** of the following :
- a) Describe the testing and repair procedure of regulated dc power supply. 6
  - b) Explain with neat block diagram the working of Analog multimeter. 6
  - c) Explain the steps in troubleshooting of a Cathode Ray Oscilloscope. 6

OR

4. Answer the following :
- a) What are the common faults and their causes in AF signal generator ? 4
  - b) Describe the troubleshooting procedure of digital multimeter. 4
  - c) Discuss common faults in resistor and their causes. 4
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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**INDUSTRIAL MICROBIOLOGY (Paper – V)**  
**VOC-IND-MIC-335 : Pollution Control Technology**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- Instructions :**
- 1) **Neat diagrams must be drawn wherever necessary.**
  - 2) **Black figures to the right indicate full marks.**
  - 3) **All questions carry equal marks.**
  - 4) **Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.**
  - 5) **Assume suitable data, if necessary.**
  - 6) **All questions are compulsory.**

1. Answer as directed.

10

For (a) to (d) state whether the statement given is **True** or **False**.

- a) BOD : COD ratio for a single wastewater is nearly always constant.
- b) Type 2 sedimentation is not relevant in primary treatment.
- c) The COD value is always higher than the BOD value of an untreated wastewater.
- d) A well-designed and operated activated sludge process, treating typical municipal wastewater, should achieve a CBOD effluent quality of 5 to 15 mg/L.

For (e) to (j) choose the best option/ answer among those given :

- e) Settable Solids (SS) are those that
  - a) Cannot be filtered out
  - b) Settle out when left standing for extended periods of time.
  - c) Pass through a filter (Whatman No. 1) with the water.
  - d) Are those that are typically removed in the Pre Treatment phase of treatment.

P.T.O.



- f) Chemicals are added to the activated sludge process to \_\_\_\_\_
  - a) To control pathogenic microorganisms
  - b) To increase the amount of required nutrients, such as nitrogen
  - c) To provide a non-buffering solution
  - d) To improve clarification
  
- g) Solids in wastewater are classified as
  - a) Organic and inorganic
  - b) Total (TR), Suspended (TSS), Dissolved (TDS), Settleable (SS), Non settleable, Floatable, Organic and Inorganic.
  - c) Treatable and Non-treatable
  - d) Total, In suspension, Settleable, Organic and Inorganic
  
- h) The efficiency of a trickling filter is measured in
  - a) Percent of electricity reduction
  - b) Percent of Mixed Liquor Re-circulated
  - c) Percent COD Reduction
  - d) Percent BOD Removed
  
- i) Detention time in wastewater typically refers to
  - a) The amount of time that it takes for sewage to make it through all treatment steps in the plant
  - b) The amount of time in the collection system from customer discharge until it reaches the treatment facilities
  - c) The amount of time it takes between starting and completing a BOD test
  - d) The time sewage is kept in a sedimentation basin
  
- j) Organic matter in wastewater can be \_\_\_\_\_ or \_\_\_\_\_ and makes up approximately \_\_\_\_\_ % of the total solids.
  - a) Dissolved or Suspended /40%
  - b) Dissolved or Suspended/ 65 %
  - c) Septic or Fresh / 85%
  - d) Domestic or Industrial / 45%





2. Answer **any two** of the following : **10**
- a) State the principle on which type I sedimentation is based, and explain the phenomenon, mentioning its application.
  - b) List the types of flotation processes used in primary treatment of wastewaters and explain any one with the help of a suitable diagram.
  - c) What are Bar screens ? Explain their role in wastewater treatment.
3. Answer **any two** of the following : **10**
- a) Describe the need and any one chemical process of phosphorus removal from wastewaters.
  - b) State how nitrogen removal from wastewaters differs from carbonaceous BOD removal. Draw a labeled diagram of a biological unit process for nitrogen removal.
  - c) Draw and explain the functioning of an anaerobic digester.
4. Answer **any one** of the following : **10**
- a) A dairy wastewater being treated using a Trickling Filter operating continuously for over 6 months is seen to be malfunctioning. The treatment efficiency is reduced to 30% in terms of BOD removed. List the possible reasons why this could be happening. Also suggest remedial measures to control/ rectify the malfunction.
  - b) Draw a flow sheet of a typical activated sludge process. Explain the critical operating parameters for efficient functioning of the process.
-





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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**SEED TECHNOLOGY**  
**(Vocational) Paper – V : Seed Pathology and Entomology**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- Instructions :**
- 1) **All questions are compulsory.**
  - 2) **Figures to the right indicate full marks.**
  - 3) **Sketch neat and labeled diagrams wherever required.**

1. Answer the following : **(1×10=10)**
  - a) Define seed pathology.
  - b) What are storage fungi ?
  - c) Mention one disease caused by seed borne bacteria.
  - d) Write the name of any one seed borne fungus.
  - e) What is seed transmission ?
  - f) Define pest.
  - g) List any two methods for seed health testing.
  - h) Give the names of any two pests on pulses.
  - i) What is the objective of seed treatment ?
  - j) What is seed storage ?
  
2. Attempt **any two** of the following : **(5×2=10)**
  - a) Explain the mechanism of seed transmission.
  - b) Give the differences between seed borne fungi and storage fungi.
  - c) Describe the damage caused by any one fibre pest and its control measures.

P.T.O.



3. Write short notes on **any two** of the following : **(5×2=10)**

- a) Seed borne viruses.
- b) General characters of order Diptera.
- c) Pests on sugarcane.

4. Describe in detail on the management of seed storage structures.

OR

Classify the pathogens responsible for seed borne diseases and give an account on any of them. **10**

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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**INDUSTRIAL CHEMISTRY (Paper – VI)**  
**Inorganic and Organic Based Industries – I**  
**(Vocational Course)**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- N.B. :** 1) **All questions are compulsory.**  
2) **Figures to the *right* indicate *full* marks.**  
3) **Neat diagrams must be drawn *wherever* necessary.**

1. Answer the following questions : **10**
- a) What is Aldrin ?
  - b) What is TNB ?
  - c) What is mustered gas ?
  - d) Define the term 'fermentation'.
  - e) Name the method by which  $\text{NH}_3$  is manufactured.
  - f) What is molasses ?
  - g) What is complete fertilizer ?
  - h) What is varnish ?
  - i) What is oleum ?
  - j) What is rectified spirit ?
2. A) Attempt **any two** of the following : **6**
- a) Describe the manufacture process of  $\text{NH}_3$  with flowsheet diagram.
  - b) What are the basic operations involved in fermentation industry ?
  - c) What is fungicide ? Where it is used ? Give one example of it.

P.T.O.



B) Attempt **any two** of the following : **4**

- a) What is Lindane ? How it is prepared ?
- b) What is nitrocellulose ? How it is prepared ?
- c) Explain the preparation of absolute alcohol.

3. Attempt **any two** of the following : **10**

- a) Describe the manufacture of raw sugar from sugarcane with a flowsheet diagram.
- b) Describe the manufacture of  $\text{HNO}_3$  by Ostwald's process.
- c) What is emulsion paint ? How it is prepared ? What are its advantages ?

4. A) Discuss the manufacture of Triple super phosphate with flowsheet and write chemical reactions involved in it. **6**

OR

A) Discuss the manufacture of ethyl alcohol from molasses. **6**

B) Attempt **any one** of the following : **4**

- a) What is Herbicide ? Give examples and state its uses.
  - b) Write a note on coffee still.
-



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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**Biotechnology (Vocational) (Paper – VI)**  
**ENVIRONMENTAL BIOTECHNOLOGY**  
**(VOC–Biotech – 336)**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) **All** questions are **compulsory**.  
2) Figures to the **right** indicate **full** marks.  
3) Draw diagrams **wherever** necessary.

1. Answer **each** of the following :

**10**

- a) What is biostimulation ?
- b) Define bioaugmentation.
- c) What is the composition of biogas ?
- d) Give any two examples of biopesticides.
- e) Explain the term “Xenobiotic compounds”
- f) What is sludge ?
- g) Define biofuel.
- h) What is biological control ?
- i) Name any two hazardous wastes.
- j) What is the difference between a pollutant and a waste ?

**P.T.O.**



2. Answer **any two** of the following : **10**
- a) What are biofertilizers ? Explain Rhizobium as a biofertilizer.
  - b) What are bioreactors ? Explain any one type of bioreactors used in waste water treatment.
  - c) Describe the applications of biosorption.
3. Write short notes on **(any two)** : **10**
- a) Ethanol production
  - b) Biotechnological applications in pesticide industry.
  - c) Composting
4. What are xenobiotic compounds ? Explain the role of biotechnology in management of xenobiotics. **10**

OR

4. Define bioremediation. What are the types of bioremediation ? Give any two applications of bioremediation.





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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**INDUSTRIAL MICROBIOLOGY (Vocational) (Paper – VI)**  
**(VOC–IND–MIC–336)**  
**Plant and Animal Tissue Culture**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- N.B. :** 1) **All** questions are **compulsory**.  
2) Figures to the **right** indicate **full** marks.  
3) **All** questions carry **equal** marks.  
4) Draw **neat** labeled diagrams **wherever** necessary.  
5) **Use** of scientific calculators is **allowed**.

1. Define the following : 10
- a) Microcarrier cultures.
  - b) Organotypic cultures.
  - c) Contact inhibition.
  - d) Histolytic cultures.
  - e) Split ratio.
  - f) Enlist Micronutrients used in Plant Tissue Culture media.
  - g) Define : Synchronous culture.
  - h) What is Meristem culture ?
  - i) What is Microinjection technique ?
  - j) What is a transgenic plant ?

P.T.O.



2. Answer **any two** of the following : **10**
- a) Discuss the role of plant growth hormones in the nutrient medium.
  - b) What is the callus culture ? Describe the factors affecting growth of callus.
  - c) What is protoplast culture ? How hybrid plants are generated by this technique ?
3. Write short notes on **any two** of the following : **10**
- a) Organ cultures on plasma clot.
  - b) HAT medium
  - c) Substratum for cells in culture.
4. Answer **any one** of the following : **10**
- a) Giving suitable examples, explain the role of different components in animal cell culture medium.
  - b) Give a detailed account of 'Gene manipulation in plants'.

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Seat  
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**T.Y. B.Sc. (Semester – III) Examination, 2012**  
**SEED TECHNOLOGY (Vocational) (Paper – VI)**  
**Seed Farm Management, Processing and Storage**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*  
3) *Draw neat and labelled diagrams wherever necessary.*

1. Answer in **one** sentence **each** : **(1×10=10)**

- a) Give any one objective of farm management.
- b) What is seed marketing ?
- c) Enlist methods of seed bagging.
- d) What is chemical seed treatment ?
- e) Define seed processing.
- f) What is farm business ?
- g) Give the name of any one seed organization in seed marketing.
- h) Enlist storage containers.
- i) What is specialized farming ?
- j) Define seed cleaning.

2. Answer the following (**any two**) : **(5×2=10)**

- a) What is bagging ? Write in detail any two methods of bagging.
- b) Describe in detail maintenance of seed processing plant.
- c) Write an account on general farming for the beginners.

P.T.O.



3. Write notes on **any two** of the following : **(5×2=10)**
- a) Farm management as personal matter.
  - b) Need of seed treatment.
  - c) Major components of seed marketing.
4. Draw a flow chart including various steps in seed processing and describe in detail management of seed processing plant. **10**

OR

4. What is farm management ? Explain with the help of graph the place of farm management.
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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**MATHEMATICS (Paper – II)**  
**MT-342 : Complex Analysis**  
**(New Course – 2008 Pattern))**

Time : 2 Hours

Max. Marks : 40

**N.B. :** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*

1. Attempt **any five** of the following :

**10**

i) Let  $f(z) = \left( \frac{x^2 - y^2}{x^2 + y^2} \right) + i(2xy)$ , ( $z = x + iy \neq 0$ ). Show that  $\lim_{z \rightarrow 0} f(z)$  doesn't exist.

ii) Show that  $f(z) = |z|^2$  is not differentiable at  $z = 2 + 3i$ .

iii) Show that  $|\exp(z^2)| \leq \exp(|z|^2)$ .

iv) Let  $z(t) = \begin{cases} t + it, & 0 \leq t \leq 1 \\ t + i, & 1 \leq t \leq 2 \end{cases}$

show that  $z(t)$  is not a smooth arc.

v) Find a representation for the function  $f(z) = \frac{1}{1+z}$  in negative powers of  $z$  that is valid when  $1 < |z| < \infty$ .

vi) Show that  $\int_{|z|=1} \exp\left(\frac{1}{z^2}\right) dz = 0$ .

vii) Show that  $f(z) = 3x + y + i(3y - x)$  is an entire function.

P.T.O.



2. Attempt **any two** of the following : 10

- i) Define three types of isolated singularities. Give examples of essential singularity and removable singularity.
- ii) If a function  $f(z) = u(x, y) + iv(x, y)$  is analytic in a domain  $D$ , then prove that its component functions  $u$  and  $v$  are harmonic in  $D$ .
- iii) Let  $C_R$  be the circle  $|z| = R$  ( $R > 1$ ). Show that

$$\left| \int_{C_R} \frac{e^z \text{Log}^2 z}{z^2} dz \right| \leq 2\pi e^R \left( \frac{\pi + \ln R}{R} \right).$$

3. Attempt **any two** of the following : 10

- i) Let  $f$  be an analytic function every where in a domain  $D$  and  $C$  be a simple closed contour inside  $D$ . If  $z_0$  is any interior point to  $C$  then prove that,

$$f(z_0) = \frac{1}{2\pi i} \int_C \frac{f(z)}{z - z_0} dz.$$

- ii) If  $f$  is an entire and bounded function in the complex plane then prove that  $f(z)$  is a constant function.
- iii) Represent the function  $f(z) = \frac{z+1}{z-1}$  by

a) Its Maclaurin series and state where the representation is valid.

b) Its Laurent series in the domain  $1 < |z| < \infty$ .

4. Attempt **any one** of the following : 10

- i) a) State and prove Cauchy residue theorem.

b) Evaluate  $\int_0^{\infty} \frac{x^2}{(x^2 + 9)(x^2 + 4)} dx$ .



ii) If  $f(z)$  is a continuous function on domain  $D \subseteq \mathbb{C}$ . Prove that the following are equivalent :

a)  $f(z)$  has antiderivative in  $D$ .

b) If  $C$  is a contour from  $z_1$  to  $z_2$  completely lying in  $D$  then  $\int_C f(z)dz = \int_{z_1}^{z_2} f(z)dz$   
that is value of integral is independent of the path connecting  $z_1$  to  $z_2$  in  $D$ .

c) If  $C$  is a closed contour lying entirely in  $D$  then  $\int_C f(z)dz = 0$ .

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**T.Y.B.Sc. (Semester – IV) Examination, 2012**  
**MATHEMATICS (Paper – III)**  
**MT-343 : Problem Course Based on MT-341 and MT-342**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- Instructions :**
- 1) **All questions are compulsory.**
  - 2) **Figures to the right indicate full marks.**
  - 3) **Answers to the two Sections should be written in separate answer books.**
  - 4) **Tie answer books of both the Sections together.**

SECTION – I

**(Metric Spaces)**

1. A) Attempt **any three** of the following :

**6**

- i) Find interior of following subsets of  $\mathbb{R}$  with usual metric.
  - a)  $\mathbb{Q}$
  - b)  $[2, 10]$
- ii) Give an example of a proper open dense subset of  $\mathbb{R}$ .
- iii) Let  $(X, d)$  be a metric space and  $f : X \rightarrow \mathbb{R}$  be continuous. Is the set  $\{x \in X \mid f(x) \geq 0\}$  closed in  $X$  ? Justify.
- iv) Let  $A$  and  $B$  be compact subsets of a metric space  $(X, d)$ . Is  $A \cap B$  compact ? Justify.

P.T.O.



B) Attempt **any one** of the following : 4

i) Let  $(X, d)$  be a metric space. Define  $\delta(x, y) = \min \{1, d(x, y)\}$ , for all  $x, y \in X$ . Show that  $\delta$  is a metric on  $X$ .

ii) Show that the discrete metric space  $(X, d)$  is complete.

2. Attempt **any two** of the following : 10

i) Show that the circle  $\{(x, y) \in \mathbb{R}^2 \mid x^2 + y^2 = 1\}$  is connected.

ii) Show that any bounded subset of  $\mathbb{R}$  is totally bounded.

iii) Show that  $\{x \in \mathbb{Q} \mid -1 < x < 1\}$  is open in  $\mathbb{Q}$  but not closed in  $\mathbb{Q}$  and the set  $\{x \in \mathbb{Q} \mid -\sqrt{2} < x < \sqrt{2}\}$  is both open and closed in  $\mathbb{Q}$ .

### SECTION – II (Complex Analysis)

1. A) Attempt **any three** of the following : 6

i) Is  $f(z) = \cos z$ , ( $z \in \mathbb{C}$ ) a bounded function? Justify.

ii) Let  $C_1$  and  $C_2$  be positively oriented circles  $|z| = 4$  and  $|z| = 3$  show that,

$$\int_{C_1} \frac{z^2 + 2z - 5}{z^2 + 1} dz = \int_{C_2} \frac{z^2 + 2z - 5}{z^2 + 1} dz$$

iii) Solve  $e^z = -1$ .

iv) Find the Laurent series that represents the function  $f(z) = z^2 \cos\left(\frac{1}{z^2}\right)$  in the domain  $0 < |z| < \infty$ .

B) Attempt **any one** of the following : 4

i) If  $u = x^2 - y^2$  and  $V = 2xy$  then show that  $v$  is a harmonic conjugate of  $u$  but  $u$  is not a harmonic conjugate of  $v$ .

ii) Evaluate  $\int_{C_1} \frac{dz}{z}$  where  $C_1$  is the right half of the circle  $|z| = 2$  ( $-\pi/2 \leq \theta \leq \pi/2$ ).



2. Attempt **any two** of the following :

10

i) Let  $f(z) = u + iv = \begin{cases} \frac{(\bar{z})^2}{z}, & z \neq 0 \\ 0, & z = 0 \end{cases}$

Verify that C-R equations  $u_x = v_y$  and  $u_y = -v_x$  are satisfied at  $(0, 0)$  but  $f'(0)$  doesn't exist.

ii) Evaluate  $\int_C (y - x - 3x^2i)$  where C is the

a) Contour consisting of straight line segments from 0 to  $i$  and  $i$  to  $1 + i$ .

b) Straight line segment joining 0 to  $1 + i$ .

iii) Let C be the positively oriented boundary of the square whose edges lie

along the lines  $x = \pm \frac{3\pi}{2}$ ,  $y = \pm \frac{3\pi}{2}$

Evaluate  $\int_C \frac{dz}{z^2 \sin z}$ .



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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**MATHEMATICS (Paper – V)**  
**MT-345 : Partial Differential Equations**  
**(2008 Pattern) (New Course)**

Time : 2 Hours

Max. Marks : 40

**N.B. :** i) *All questions are compulsory.*  
ii) *Figures to the right indicate full marks.*

1. Attempt **any five** of the following : **10**

i) Find the integral curves of the equations

$$\frac{dx}{z-y} = \frac{dy}{x-z} = \frac{dz}{y-x}$$

ii) Verify that the equation  $(y^2 + xz)dx + (x^2 + yz)dy + 3z^2dz = 0$  is integrable.

iii) Solve the equation

$$a^2 y^2 z^2 dx + b^2 x^2 z^2 dy + c^2 x^2 y^2 dz = 0 \text{ by variables separable method.}$$

iv) Eliminate the arbitrary function F from  $F(x + y, x - \sqrt{z}) = 0$

v) Find the general solution of  $yzp + xzq = xy$ .

vi) Find a complete integral of  $f(p, q) = p + q - pq = 0$

vii) Write Jacobi's auxiliary equations for  $f(x, y, z, u_x, u_y, u_z) = 0$ .

2. Attempt **any two** of the following : **10**

i) Find the integral curves of the equations  $\frac{adx}{(b-c)yz} = \frac{bdy}{(c-a)zx} = \frac{cdz}{(a-b)xy}$ .

ii) Explain Natani's method of solving Pfaffian differential equation  
 $Pdx + Qdy + Rdz = 0$

iii) Verify that the equation  $yzdx + xzdy + xydz = 0$  is integrable and find its primitives.

P.T.O.



3. Attempt **any two** of the following :

10

i) Show that a necessary and sufficient condition that there exists a relation  $F(u, v) = 0$  which does not contain  $x$  and  $y$  explicitly, between two functions

$$u = u(x, y) \text{ and } v = v(x, y) \text{ is } \frac{\partial(u, v)}{\partial(x, y)} = 0.$$

ii) Find the integral surface of the linear partial differential equation  $x(y^2 + z)p - y(x^2 + z)q = (x^2 - y^2)z$  which contains the straight line  $x + y = 0; z = 1$ .

iii) Show that  $p^2 + q^2 = 1$  and  $(p^2 + q^2)x = pz$  are compatible equations.

4. Attempt **any one** of the following :

10

i) a) Find the complete integral of  $p = (z + qy)^2$  by using Charpit's method.

b) Prove that a necessary and sufficient condition for the integrability of  $dz = \phi(x, y, z)dx + 4(x, y, z)dy$  is

$$[f, g] = \frac{\partial(f, g)}{\partial(x, p)} + p \frac{\partial(f, g)}{\partial(z, p)} + \frac{\partial(f, g)}{\partial(y, q)} + q \frac{\partial(f, g)}{\partial(z, q)} = 0$$

ii) a) Find the complete integral of  $P_1^3 + P_2^2 + P_3 = 1$  by using Jacobi's method.

b) Explain Charpit's method for solving the partial differential equation  $f(x, y, z, p, q) = 0$



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Seat  
No.

T.Y. B.Sc. (Semester – IV) Examination, 2012  
MATHEMATICS (Paper – VI)  
MT – 346 : Problem Course Based on MT-344 and MT-345  
(2008 Pattern)

Time : 2 Hours

Max. Marks : 40

- N.B. :** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*  
3) *Use separate answer book for each Section.*  
4) *Tie both the answer books together.*

SECTION – I  
(Ring Theory)

1. A) Attempt **any three** of the following : 6
- i) How many solutions does the equation  $x^2 - 5x + 6 = 0$  have in  $\mathbb{Z}_4$  ?
  - ii) State the characteristic of  $\mathbb{Z}_5$  and  $5\mathbb{Z}$ .
  - iii) Show that the polynomial  $2x + 1$  in  $\mathbb{Z}_4[x]$  has a multiplicative inverse in  $\mathbb{Z}_4[x]$ .
  - iv) Determine whether  $x^5 + 6x^4 + 6x^2 + 12$  is irreducible over  $\mathbb{Q}$ .
- B) Attempt **any one** of the following : 4
- i) A ring  $R$  is called a Boolean ring if  $a^2 = 0$ , for all  $a \in R$ . Show that a Boolean ring  $R$  is a commutative ring.
  - ii) Show that the polynomial  $x^2 + x + 4$  is irreducible over  $\mathbb{Z}_{11}$ .
2. Attempt **any two** of the following : 10
- i) Let  $\mathbb{R}[x]$  denote the ring of polynomials with real coefficients. Let  $\langle x^2 + 1 \rangle$  denote the principal ideal generated by  $x^2 + 1$ . Obtain  $\mathbb{R}[x] / \langle x^2 + 1 \rangle$ .

P.T.O.



ii) Let  $S = \left\{ \left[ \begin{array}{cc} a & b \\ -b & a \end{array} \right] / a, b \in \mathbb{R} \right\}$ . Show that the function  $\phi: \mathbb{C} \rightarrow S$  given by

$$\phi(a + ib) = \left[ \begin{array}{cc} a & b \\ -b & a \end{array} \right] \text{ is a ring isomorphism.}$$

iii) Let  $R$  be the ring of real valued functions on  $[0, 1]$ . Define  $I = \left\{ f \in R / f\left(\frac{1}{2}\right) = 0 \right\}$ . Show that  $I$  is an ideal of  $R$ . Is it a maximal ideal of  $R$ ? Justify.

SECTION – II  
(Partial Differential Equations)

3. A) Attempt **any three** of the following :

6

i) Find the integral curves of the equations

$$\frac{dx}{y} = \frac{dy}{x} = \frac{dz}{xyz^2(x^2 - y^2)}$$

ii) Obtain the partial differential equation by eliminating the arbitrary constants  $a$  and  $b$  from the equation  $ax^2 + by^2 + z^2 = 1$ .

iii) Show that the differential equation  $(2x + y^2 + 2xz) dx + 2xydy + x^2 dz = 0$  is integrable.

iv) Find a complete integral of the Clairaut partial differential equation

$$Z = px + qy + pq.$$

B) Attempt **any one** of the following :

4

i) Show that the equations  $f = p^2 + q^2 - 1 = 0$  and  $g = (p^2 + q^2)x - pz = 0$  are compatible.

ii) Find the orthogonal trajectories on the cone  $x^2 + y^2 = z^2 \tan^2 \alpha$  of its intersection with the family of planes parallel to  $z = 0$ .



4. Attempt **any two** of the following :

10

i) Find the integral surface of  $x^2p + y^2q + z^2 = 0$ , which passes through the hyperbola  $xy = x + y, z = 1$ .

ii) Find the complete integral by Jacobi's method,  $P_1 P_2 P_3 = Z^3 x_1 x_2 x_3$ .

iii) Verify that the equations

a)  $z = \sqrt{2x+a} + \sqrt{2y+b}$  and

b)  $z^2 + \mu = 2(1 + \lambda^{-1})(x + \lambda y)$  are both complete integrals of the partial

differential equation  $Z = \frac{1}{p} + \frac{1}{q}$

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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**MATHEMATICS (Paper – VII)**  
**MT – 347 : (Elective – II) Computational Geometry**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- Note :** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*  
3) *Use of scientific calculator is allowed.*

1. Attempt **any five** of the following : **10**

- i) What is the determinant of the inverse of any pure rotation matrix ?
- ii) The line segment joining the points A [4 9], B [– 2 1] is transformed to the line segment A\*B\* by the transformation matrix  $[T] = \begin{bmatrix} 2 & 0 \\ 0 & 2 \end{bmatrix}$ . Find the midpoint of A\*B\*.
- iii) Write the transformation matrix for shear in X-co-ordinate by factor 6 units proportional to Y-co-ordinate and shear in Z-co-ordinate by a factor of 3 units proportional to X-co-ordinate.
- iv) Obtain the transformation matrix for orthographic projection to create the top view of the object.
- v) Find the angle  $\delta\theta$  to generate 5 equidistant points on the parabolic segment in the first quadrant for  $2 \leq x \leq 8$  of the parabola  $y^2 = 8x$ .
- vi) Obtain the transformation matrix for a Cavalier projection, if the horizontal angle  $\alpha = 45^\circ$ .
- vii) Write the parametric equations of the Be'zier curve with three control points.

P.T.O.



2. Attempt **any two** of the following :

10

i) If a  $2 \times 2$  transformation matrix  $[T] = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$  is used to transform the line segment AB having slope  $m$  to the line segment  $A^*B^*$ , then prove that slope of the line segment  $A^*B^*$  is  $m^* = \frac{b + dm}{a + cm}$ .

ii) Find the concatenated transformation matrix for rotation about the point  $[-1 \ 2]$  by an angle  $\pi^c$ . Apply this rotation on to the triangle with vertices  $A[1 \ 1]$ ,  $B[4 \ 1]$  and  $C[2 \ 4]$ .

iii) Obtain the transformation matrix for the dimetric projection with  $f_z = \frac{1}{3}$  and also find  $f_x$  and  $f_y$ . (Take  $\phi > 0, \theta < 0$ ).

3. Attempt **any two** of the following :

10

i) If L is a line passing through the origin and the point  $(1, -2, 2)$ . Determine the angles through which the line L should be rotated about X-axis and then about Y-axis, so that it coincides with Z-axis.

ii) Obtain the concatenated transformation matrix for the following sequence of transformations. First translate in x and z directions by 2 and 1 units respectively, followed by shearing in y-direction proportional to x and z co-ordinates with  $\frac{1}{2}$  and 3 units respectively, followed by reflection in xz-plane. Apply it on the point  $[0 \ 0 \ 0]$ .

iii) Write an algorithm to generate uniformly spaced n-points on the circumference of the circle  $(x - h)^2 + (y - k)^2 = r^2$ .



4. Attempt **any one** of the following :

10

i) a) Find the parametric equations of the Be'zier curve determined by the control points  $B_0 [4 \ 3]$ ,  $B_1 [0 \ 1]$ ,  $B_2 [2 \ -1]$ . Also find the first and second derivative of the curve at  $t = 0.3$

b) Generate 4 points of the ellipse  $\frac{(x-2)^2}{4} + \frac{(y-2)^2}{1} = 1$  , whose major axis inclined  $30^\circ$  to the horizontal.

ii) a) Obtain a single point perspective projection onto  $Z = 0$  plane of the object

$$[X] = \begin{bmatrix} 0 & 3 & 1 \\ 1 & 1 & 0 \\ 1.5 & 0 & -2 \end{bmatrix} \text{ from the centre of pojection at } Z_c = 4 \text{ on the Z-axis.}$$

b) Define Cabinet projection. Find the Cabinet projection of the object

$$[X] = \begin{bmatrix} 1 & 2 & 1 \\ 3 & 4 & -1 \\ 2 & 3 & 1 \end{bmatrix} \text{ with horizontal inclination angle } \alpha = 25^\circ .$$



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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**MATHEMATICS (Paper – VII)**  
**MT – 347 : Optimization Techniques**  
**(Elective – II) (New Course) (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

**N.B. :** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*

1. Attempt **any five** of the following : **10**

- i) Define the term idle time and total elapsed time.
- ii) What are the three types of replacement problems ?
- iii) Draw the network for the following relationship :  

<b>Event no</b>	:	1	2, 3	4	5	6	7
<b>Preceded by</b>	:	Start event	1	2, 3	3	4, 5	5, 6
- iv) Examine the following function for extreme points :  $f(x) = x^4 + x^2$ .
- v) What are the three time estimates used in the context of PERT ?
- vi) Give any two characteristics of a two person zero-sum game.
- vii) Two players A and B match coins. If the coins match, then A wins Rs. 2, if the coins do not match, then B wins Rs. 2. Determine the pay-off matrix.

2. Attempt **any two** of the following : **10**

- i) There are seven jobs, each of which has to go through the machines A and B in the order AB. Processing times in hours are as follows.

<b>Job</b>	:	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
<b>Machine A</b>	:	3	12	15	6	10	11	9
<b>Machine B</b>	:	8	10	10	6	12	1	3

Determine a sequence of these jobs that will minimize the total elapsed time T.

Also find T and idle time for machine B.

P.T.O.



- ii) An electromechanical equipment has a purchase price of Rs. 7,000. Its running cost per year and resale value per year are given below.

<b>Year</b>	<b>:</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
<b>Running Cost (Rs.)</b>	<b>:</b>	2000	2100	2300	2600	3000	3500	4100
<b>Resale value (Rs.)</b>	<b>:</b>	4000	3000	2200	1600	1400	700	700

Determine at what age its replacement is due ?

- iii) Construct the project network for the following constraints  
 A, B < D ; B < E, F, H ; F, C < G ; E, H < I, J ; K < L ; C, D, F, J < K.  
 Here X < Y means X is an immediate predecessor of Y.

3. Attempt **any two** of the following :

**10**

- i) Find the extreme points of the following function  
 $f(x_1, x_2, x_3) = x_1 + 2x_3 + x_2 x_3 - x_1^2 - x_2^2 - x_3^2$ .
- ii) Using dominance rule, find the optimal strategies for player A and player B in the following game. Also determine the value of the game.

		<b>B</b>			
		B <sub>1</sub>	B <sub>2</sub>	B <sub>3</sub>	B <sub>4</sub>
<b>A</b>	A <sub>1</sub>	19	6	7	5
	A <sub>2</sub>	7	3	14	6
	A <sub>3</sub>	12	8	18	4
	A <sub>4</sub>	8	7	13	-1

- iii) Solve the following game using graphical method and find the value of the game.

		<b>B</b>	
		B <sub>1</sub>	B <sub>2</sub>
<b>A</b>	A <sub>1</sub>	-1	6
	A <sub>2</sub>	-4	4
	A <sub>3</sub>	1	-1
	A <sub>4</sub>	2	1
	A <sub>5</sub>	2	-3



4. Attempt **any one** of the following :

10

i) A project consists of a series of tasks labeled A, B, . . . , H, I with the following relationships (constraints)

$A < D, E ; B, D < F ; C < G ; B < H ; F, G < I, G < H$

The time (in days) for each task is given below :

<b>Task</b>	<b>:</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>F</b>	<b>G</b>	<b>H</b>	<b>I</b>
<b>Time (in days)</b>	<b>:</b>	24	9	21	17	25	19	20	5	11

- a) Draw a network diagram for the project.
- b) Find a critical path and project completion time.
- c) Determine the total float and free float of each activity.

ii) A project consists of nine activities whose time estimates and other characteristics are given below

- a) Draw the PERT network for the project.
- b) Determine the critical path and expected project completion time.

Activity	Predecessor (s)	Time		
		Optimistic	Most likely	Pessimistic
<b>A</b>	–	2	4	6
<b>B</b>	–	6	6	6
<b>C</b>	–	6	12	24
<b>D</b>	A	2	5	8
<b>E</b>	A	11	14	23
<b>F</b>	B, D	8	10	12
<b>G</b>	B, D	3	6	9
<b>H</b>	C, F	9	15	27
<b>I</b>	E	4	10	16







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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**MATHEMATICS (Paper – VII) (Elective – II)**  
**MT – 347 : Improper Integrals and Laplace Transforms**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

**N.B :** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*

1. Attempt **any five** of the following :

10

i) Show that the improper integral  $\int_1^{\infty} \frac{\sin x}{x^2} dx$  is convergent.

ii) Justify whether the following statement is true or false.

$\int_0^2 \frac{x}{1-x} dx$  is an improper integral of the second kind.

iii) Find Cauchy's principle value of  $\int_{-\infty}^{\infty} x dx$ .

iv) Find  $L\{3e^{2t} - 5\}$ .

v) Find  $L^{-1}\left\{\frac{1}{s^2 + as}\right\}$ .

vi) Find  $L\{F(t)\}$ , where  $F(t) = \begin{cases} 1, & t > a \\ 0, & t < a \end{cases}$ .

vii) Find  $L^{-1}\left\{\frac{1}{s}\right\}$ .

P.T.O.



2. Attempt **any two** of the following. 10

i) State and prove the comparison test for convergence of an improper integral of the first kind.

ii) Discuss the convergence of  $\int_0^{\infty} e^{-x} \sin x \, dx$

iii) Show that the improper integral  $\int_0^1 \frac{\sec x}{x} \, dx$  diverges.

3. Attempt **any two** of the following : 10

i) State and prove the convolution theorem for Laplace transforms.

ii) Find  $L\{e^{-3t}(2 \sin 5t - 5 \cos 5t)\}$  by using shifting property.

iii) If  $F(t)$  is a continuous function of  $t$  and has Laplace transform  $L\{F(t)\} = f(s)$ , then prove that  $L\left\{\frac{d}{dt} F(t)\right\} = sf(s) - F(0)$ , where  $L\left\{\frac{d}{dt} F(t)\right\}$  exists.

4. Attempt **any one** of the following. 10

i) a) Prove that  $\int_0^{\infty} \frac{x}{(1+x)^3} \, dx = \frac{1}{2} \int_0^{\infty} \frac{1}{(1+x)^2} \, dx$ .

b) Let  $F$  be a piecewise continuous function on  $[0, \infty)$  and of exponential order. If  $L\{F(t)\} = f(s)$ ; and if  $\lim_{t \rightarrow 0^+} \frac{F(t)}{t}$  exists, then prove that

$$\int_s^{\infty} f(x) \, dx = L\left\{\frac{F(t)}{t}\right\}.$$

ii) a) Solve the following initial value problem by using Laplace transform.

$$y'' + 3y' + 2y = t, \text{ given that } y(0) = 1, y'(0) = -1; \text{ where } y' = \frac{dy}{dt}, y'' = \frac{d^2y}{dt^2}.$$

b) Find  $L^{-1}\left\{\frac{s^2}{(s^2 + a^2)(s^2 + b^2)}\right\}$ .



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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**MATHEMATICS (Paper – VII)**  
**MT – 347 : Dynamics (Elective – II)**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

**N.B.:** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*

1. Attempt **any five** of the following : **10**
- i) Find the magnitude and direction of the resultant velocity of a moving particle if  $u = 3$ ,  $v = 4$ ,  $\alpha = 30^\circ$ .
  - ii) A particle acted upon by a force  $\vec{F} = 10\mathbf{i} + 3\mathbf{j} - 6\mathbf{k}$  undergoes a displacement  $2\mathbf{i} - 4\mathbf{j} - 2\mathbf{k}$ . Find the work done.
  - iii) Define horizontal range of a projectile and state the formula for it.
  - iv) A ball is thrown vertically upwards with a velocity of 30 m/sec. How high will it go ?
  - v) The pedal equation of a parabola is  $p^2 = ar$ , where focus is the pole. Find the law of force.
  - vi) Deduce Newton's first law of motion from the second law.
  - vii) The distance  $S$  metres travelled in  $t$  seconds by the particle moving along a straight line is given by  $S = 2t^3 - 9t^2 + 12t + 6$ . Find when its acceleration becomes zero and the velocity at that instant.

P.T.O.



2. Attempt **any two** of the following :

10

- i) Obtain radial and transverse components of velocity and acceleration.
- ii) A particle possesses simultaneously velocities of 12 m/sec due east and 20 m/sec. due 30° east of north. Find the magnitude and direction of the resultant velocity.
- iii) Two masses in an Atwood's machine are  $m_1$  and  $m_2$ . If  $m_1$  (which is  $> m_2$ ) descends with acceleration  $f$ , show that the mass which must be taken away from it so that it can ascend with the same acceleration is  $\frac{4m_1fg}{(f+g)^2}$ .

3. Attempt **any two** of the following.

10

- i) With usual notation prove that  $\frac{d^2u}{d\theta^2} + u = \frac{F}{h^2u^2}$ .
- ii) A particle describes a curve  $r = a(1 + \cos\theta)$  under the action of a central force directed towards the origin. Find the law of force.
- iii) Show that the velocity with which a particle must be projected down an inclined plane of length  $l$  and height  $h$ , so that the time of descent shall be the same as taken by another particle in falling freely a distance equal to the height of the plane is  $\frac{l^2 - h^2}{l} \sqrt{\frac{g}{2h}}$ .

4. Attempt **any one** of the following :

10

- i) a) A particle of mass  $m$  is projected in a vertical plane with velocity  $u$  at an angle  $\alpha$  to the horizontal under the action of gravity. Find the equation of trajectory.
- b) Prove that if the time of flight of a bullet over a horizontal range  $R$  is  $T$  seconds, the inclination of the velocity of projection to the horizontal is

$$\tan^{-1}\left(\frac{gT^2}{2R}\right).$$

- ii) a) State and prove the principle of work energy.
- b) A uniform elastic string has length  $a_1$  when the tension is  $T_1$  and a length  $a_2$  when tension is  $T_2$ . Show that its natural length is  $\frac{a_2T_1 - a_1T_2}{T_1 - T_2}$ .



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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**MATHEMATICS (Paper – VII)**  
**MT-347 : (Elective – II) : Lebesgue Integration**  
**(New Course) (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

**N.B. :** i) *All questions are compulsory.*  
ii) *Figures to the right indicate full marks.*

1. Attempt **any five** of the following : **10**

i) Is the following statement true or false ? Justify 'If  $F$  is a closed subset of  $[a, b]$  and  $|F| = 0$ , then  $F = \phi$ '.

ii) Define outer measure and inner measure of a set.

iii) Is a countable set measurable ? Justify your answer.

iv) If  $f$  is a measurable function and  $k > 0$  is a real number, prove that  $kf$  is a measurable function.

v) If  $f$  is an odd function, prove that  $\int_{-\pi}^{\pi} f(x) dx = 0$ .

vi) Define length of an open set of  $[a, b]$ .

vii) If  $E \subseteq [a, b]$ , prove that  $\underline{m} E \leq \overline{m} E$ .

2. Attempt **any two** of the following : **10**

i) If  $G_1$  and  $G_2$  are open sets in  $[a, b]$  such that  $G_1 \subseteq G_2$ , then prove that  $|G_1| \leq |G_2|$

ii) If  $\{f_n\}_{n=1}^{\infty}$  is a sequence of measurable functions on  $[a, b]$  and if  $\lim_{n \rightarrow \infty} f_n(x) = f(x)$  almost everywhere on  $[a, b]$ , then prove that  $f$  is measurable.

iii) Let  $f$  be a bounded function on  $[a, b]$ . If  $f \in R[a, b]$  prove that  $f \in L[a, b]$  and

$$R \int_a^b f = L \int_a^b f.$$

P.T.O.



3. Attempt **any two** of the following : 10

i) If  $E_1, E_2, \dots$  are measurable subsets of  $[a, b]$  such that  $E_1 \subseteq E_2 \subseteq \dots \subseteq E_n \subseteq E_{n+1} \dots$ , then prove that  $\bigcup_{n=1}^{\infty} E_n$  is a measurable set and  $m\left(\bigcup_{n=1}^{\infty} E_n\right) = \lim_{n \rightarrow \infty} mE_n$ .

ii) If  $f$  is a bounded function in  $L[a, b]$  and  $\lambda \in \mathbb{R}$ , then prove that  $\lambda f \in L[a, b]$

$$\text{and } \int_a^b \lambda f = \lambda \int_a^b f.$$

iii) Let  $f \in L[a, b]$ . Given any  $\epsilon > 0$ , prove that there exists a  $\delta > 0$  such that

$$\left| \int_E f \right| < \epsilon; \text{ whenever } E \text{ is a measurable subset of } [a, b] \text{ with } mE < \delta.$$

4. Attempt **any one** of the following : 10

i) a) Let  $f(x) = \frac{1}{x^p}, 0 < x \leq 1$   
 $= 0, x = 0.$

Prove that  $f \in L[0, 1]$  if  $p < 1$  and that  $\int_0^1 f = \frac{1}{1-p}$ .

b) Find the Fourier series for the function  $f(x) = x, -\pi \leq x \leq \pi$ .

ii) a) Find  $f^+$  and  $f^-$  if  $f(x) = \frac{1}{2} + \sin x; 0 \leq x \leq 2\pi$ .

b) Let  $f(x) = 0; -\pi \leq x < 0$   
 $= 1; 0 \leq x \leq \pi$

Find the fourier series for  $f$  and check whether the Fouier series converges to  $f(0)$ .



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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**PHYSICS (Paper – I)**  
**PH – 341 : Solid State Physics**  
**(New Course) (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- N.B. :** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*  
3) *Use of log tables and calculators is allowed.*

1. Attempt **all** of the following (1 mark each) : **10**
- a) Define the term 'Symmetry operations'.
  - b) What is 'mobility' ?
  - c) Give the principle of photoelectron spectroscopy.
  - d) What are Miller indices ?
  - e) Define the term 'Band gap energy ( $E_g$ )'.
  - f) Define the term 'Co-ordination number' of an atom.
  - g) What is Curie temperature ?
  - h) Define the term 'Density of states'.
  - i) Give any two applications of scanning electron microscopy.
  - j) What is superconductor ?
2. Attempt **any two** :
- a) Obtain an expression for interplaner spacing for simple cubic system. **5**
  - b) Write a short note on scanning tunneling electron microscopy. **5**
  - c) State and explain 'Meissner effect'. **5**

P.T.O.



3. Attempt **any two** :

- a) A FCC crystal has an atomic radius of  $1.246 \text{ \AA}$ . Find the interplaner spacing for the set of parallel planes having Miller indices (111) and (220). **5**
- b) In a unit cell of simple cubic structure, find the angle between the normals to pair of planes whose Miller indices are (i) (100) and (010), and (ii) (121) and (111). **5**
- c) Evaluate the temperature at which there is one percent probability that a state with an energy 0.3 eV above the Fermi energy, will be occupied by an electron. (Given :  $K_B = 1.38 \times 10^{-23}$  joule / kelvin). **5**

4. A) Attempt **any one** :

- 1) Obtain an expression for density of states in three dimensions and average energy of an electron at absolute zero temperature. **8**
- 2) What do you mean by ferrimagnetism ? What are soft and hard ferrites ? State any four applications of ferrites. **8**

B) Attempt **any one** :

- 1) Calculate the packing fraction for simple cubic system. **2**
- 2) Calculate longest wavelength that can be analyzed by rock salt of crystal of spacing  $2 \text{ \AA}$  in the first order. **2**

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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**PHYSICS (Paper – III)**  
**PH-343 : Thermodynamics and Statistical Physics**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- N.B. :** 1) *All questions are **compulsory**.*  
2) *Figures to the **right** indicate **full** marks.*  
3) *Use of log tables and calculator is **allowed**.*

1. Attempt **all** of the following (**one** mark **each**) : **10**
- a) What are 'Transport phenomena' ?
  - b) Define phase space.
  - c) Define 'Statistical Ensemble'.
  - d) State the postulate of 'equal a priori probabilities'.
  - e) What are bosons ?
  - f) Define Grand canonical ensemble.
  - g) What are symmetric wave functions ?
  - h) Define the density of states.
  - i) What is the probability of drawing a 'Queen' from a deck of 52 cards ?
  - j) Calculate the volume of a phase cell in  $\mu$ -space.

P.T.O.



2. Attempt **any two** :

- a) Show that  $K = \eta C_v$  where  $K$  is coefficient of thermal conductivity,  $\eta$  is coefficient of viscosity and  $C_v$  is specific heat at constant volume of a gas discuss the effect of pressure and temperature on  $K$ . 5
- b) Compare the results of M.B, B.E. and F.D. statistics. 5
- c) Obtain Binomial distribution equation using random walk problem. 5

3. Attempt **any two** :

- a) Calculate the frequency of collision of the chlorine molecules from the following data

$$\text{Density of chlorine} = 2.76 \text{ kg/m}^3$$

$$\text{Mean free path} = 4.57 \times 10^{-8} \text{ m}$$

$$\text{Coefficient of viscosity} = 1.29 \times 10^{-5} \text{ Nsm}^{-2}. \quad \text{5}$$

- b) If  $P = q = \frac{1}{2}$  and total number of possibilities are  $N = 200$ , find :

i) Mean value of  $n_1$  ie  $\bar{n}_1$

ii) Root mean square deviation

iii) Mean displacement  $\bar{m}$ . 5

- c) Prove the Tds relations :

i)  $Tds = C_v dT + T \left( \frac{\partial P}{\partial T} \right)_v dv$

ii)  $Tds = C_p dT - T \left( \frac{\partial v}{\partial T} \right)_p dp$ . 5



4. A) Attempt **any one** :

a) Explain Joule Thomson effect. Obtain Joule Thomson coefficient

$$\mu = \frac{1}{C_p} \left[ T \left( \frac{\partial V}{\partial T} \right)_p - V \right]. \quad 8$$

b) In case of Fermi. Dirac statistics prove that  $\bar{n}_r = \frac{1}{e^{\beta(\epsilon_r - \mu)} + 1}$  8

where symbols have their usual meanings.

B) Attempt **any one** :

i) Explain thermal interaction between two systems. 2

ii) A bag contains 10 red balls and 8 white balls .The balls are drawn at random one after the other. What is the probability that both balls are red ? 2

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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**PHYSICS (Paper – IV)**  
**PH-344 : Nuclear Physics (New)**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- N.B :** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*  
3) *Use of logtable and calculator is allowed.*

1. Attempt **all** of the following (1 mark each) **10**
- a) Define the term mean life.
  - b) State the relation between density of Water and Nuclear Density.
  - c) What do you mean by induced activity ?
  - d) State any one of the characteristic feature of the nuclear force.
  - e) Draw diagram for the formation of neutron using Quark model.
  - f) What is Stellar energy ?
  - g) What do you mean by Q-value of nuclear reaction ?
  - h) State the function of nuclear reactor.
  - i) Mention any one evidence that support shell model.
  - j) Write the general reaction for formation of the compound nucleus.

P.T.O.



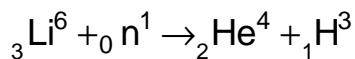
2. Attempt **any two** of the following :

- a) Obtain an expression of mean life in terms of its decay constant and half life. **5**
- b) Write a note on Elementary Particles. **5**
- c) What is meant by threshold energy of nuclear reaction ? Obtain an expression for it. **5**

3. Attempt **any two** of the following :

- a) The disintegration rate of certain radioactive substance at any instant is 4750 disintegrations per minute. Five minutes later, the rate becomes 2700 disintegrations per minute. Calculate half life of the sample. **5**

b) Calculate the energy released in the reaction



Given : Mass of  ${}_3\text{Li}^6 = 6.015126$  a.m.u.

Mass of  ${}_2\text{He}^4 = 4.002603$  a.m.u.

Mass of  ${}_1\text{H}^3 = 3.016049$  a.m.u.

Mass of  ${}_0\text{n}^1 = 1.008665$  a.m.u.

and 1 a.m.u. = 931 MeV. **5**

- c) The thermal power level of the reactor is 100 MW. The reactor uses  $\text{U}^{235}$  as fuel. Calculate the number of nuclei of  $\text{U}^{235}$  that will be fissioned in one year. The energy of 200 MeV is liberated per fission of  $\text{U}^{235}$ . **5**

4. A) Attempt **any one** of the following :

- a) Draw a sketch of a G.M. Counter. Explain its construction and working. **8**
- b) What are the assumptions of liquid drop model ? Obtain the semi-empirical mass formula for the mass of nucleus. **8**

B) Attempt **any one** of the following :

- a) Determine the spin and parity of  ${}_7\text{N}^{15}$ . **2**
- b) What is successive disintegration ? **2**



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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**PHYSICS (Paper – V)**  
**PH – 345 (A) : Electronics**  
**(2008 Pattern) (New)**

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) **All questions are compulsory.**  
2) **Figures to the right indicate full marks.**  
3) **Use of log table and calculator are allowed.**

1. Attempt **all (one mark each)** : **10**
- a) State any two advantages of LED.
  - b) Enlist four classes of amplifier.
  - c) Define the term Amplification factor.
  - d) When a reverse gate voltage of 15 V is applied to a FET, the gate current is  $10^{-3} \mu\text{A}$ . Find the resistance between gate and source.
  - e) What is meant by comparator ?
  - f) Define common mode rejection ratio.
  - g) Find the value of resistor  $R_A$  of monostable multivibrator if pulse width is 2.2 ms and capacitor is of  $1 \mu\text{F}$ .
  - h) What are the basic blocks of power supply ?
  - i) What do you mean by SOP ?
  - j) What is counter ? State types of counter.

P.T.O.



2. Attempt **any two** :
- a) Explain the construction of N–channel JFET. Draw its drain characteristic curves. 5
  - b) Explain the action of an op-amp as a differentiator, derive the necessary formula for output. 5
  - c) Explain the designing of high voltage regulator using IC 723. Draw the suitable circuit diagram. 5
3. Attempt **any two** :
- a) Determine the frequency of oscillation for the astable multivibrator using IC 555.  
Given :  $R_A = R_B = 10\text{ K}\Omega$  and  $C = 0.01\ \mu\text{F}$  5
  - b) Using K-map technique minimize the following logical expression in the SOP form  $Y = \overline{A}\overline{B}\overline{C}\overline{D} + A\overline{B}\overline{C}\overline{D} + \overline{A}B\overline{C}D + A\overline{B}CD$ . 5
  - c) Explain the working of a 4-bit asynchronous counter with suitable diagram and input-output waveforms. 5
4. A) Attempt **any one** : 8
- a) What is difference between combinational and sequential logic ? What are multiplexers and demultiplexers ? Draw the diagram for 8 input multiplexers.
  - b) Explain cross over distortion in push pull amplifier. Draw the circuit diagram for class B push-pull amplifier. How is it eliminated ?
- B) Attempt **any one** :
- a) Define optocoupler and draw the optocoupler circuit. 2
  - b) Draw the block diagram of IC 555. 2
-





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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**PHYSICS (Paper – V)**  
**PH – 345 (B) : Advanced Electronics**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- N.B. :** 1) **All questions are compulsory.**  
2) **Figures to the right indicate full marks.**  
3) **Draw neat diagrams wherever necessary.**  
4) **Use of log table and calculators is allowed.**

1. Attempt **all** of the following (**one mark each**) :

- a) What is photoconductive effect ?
- b) What do you mean by a process control ?
- c) Draw a circuit symbol for solenoid valve.
- d) Draw a Thevenin equivalent circuit for a photovoltaic cell.
- e) State Peltier effect in thermocouple.
- f) State the properties of Laser light.
- g) State the working principle of gas thermometer.
- h) Draw a circuit diagram of low pass and high pass RC filters.
- i) State the types of motion.
- j) State the objectives of control system.

2. Attempt **any two** :

- a) What is pyrometry ? Write a short note on narrowband pyrometers. **5**
- b) Write a short note on common software functions provided by a modern PLC's. **5**
- c) State different types of accelerometers and explain any one in detail. **5**



3. Attempt **any two** :
- a) What is data acquisition system ? With suitable diagram explain its hardware. **5**
  - b) Explain in short loading effect and how it affect the output of a process variable with necessary equation. **5**
  - c) A measurement signal frequency is less than 1KHz but there is an unwanted noise at about 1MHz. Design a RC low pass filter that attenuates noise to 1%. Given  $C = 0.01 \mu f$ . **5**
4. A) Attempt **any one** :
- a) Draw a neat diagram of ON/OFF control system for cooling / heating a medium (home air conditioning system) and explain its operation in detail. **8**
  - b) Draw a block diagram for programmable logic controller and explain its operation in brief. **8**
- B) Attempt **any one** :
- a) If the tank has a relationship between flow and level given by  $Q_{out} = k\sqrt{h}$ , where  $h$  is height in feet and  $k = 1.156$  (gal/min)/ft<sup>1/2</sup>. Suppose the input flow rate is 2 gal/min. At what value of  $h$  will the level stabilize from self regulation ? **2**
  - b) A gas in a closed volume has a pressure of 120 psi at a temperature of 20° C. What will the pressure be at 100° C ? **2**
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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**CHEMISTRY (Paper – II)**  
**CH – 342 : Inorganic Chemistry**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- N.B.:**
- i) **All questions are compulsory.**
  - ii) Figures to **right** indicate **full** marks.
  - iii) Actual calculations must be shown.
  - iv) Marks are reserved for neat and labelled diagrams.
  - v) Use of log table and calculator is **allowed**.
  - vi) Atomic numbers : Cr (24), Co (27).

1. Answer the following : 10

- i) What is the symbol for an element with atomic number 209 ?
- ii) Define metalloenzymes.
- iii) How many bridging carbonyls are present in  $[\text{Cr}(\text{CO})_6]$  ?
- iv) Give general electronic configuration of Lanthanides.
- v) Draw the solid state structure of  $[\text{Fe}_2(\text{CO})_9]$ .
- vi) Arrange Ag, Ca and Al metals in increasing order of conductivity.
- vii) What is the effect of increase in temperature on the conductivity of metals ?
- viii) What is meant by radius ratio effects ?
- ix) How many unpaired electrons are present in high spin  $d^5$  Octahedral complex ?
- x) What are the different types of closest packed structures ?

2. A) Write short notes on **any two** of the following : 6

- i) Misch metals
- ii) Biological role of Cobalt
- iii) Schottky defect.

P.T.O.



- B) Answer **any two** of the following : 4
- i) Give difference between crystalline and amorphous solids.
  - ii) Count the number of electrons in  $[\text{Co}_2(\text{CO})_8]$ .
  - iii) Calculate CFSE in terms of  $D_q$  for  $d^7$  system in weak octahedral ligand field.
3. Answer **any two** of the following : 10
- i) What are superconductors ? List different methods for the preparation of superconductors. Give applications of superconductors.
  - ii) What is lanthanide contraction ? Discuss the effects of lanthanide contraction.
  - iii) Explain the hydroformylation reaction for the synthesis of aldehydes.
4. A) What are semiconductors ? List different types of semiconductors. Explain with the help of  $N(E)$  diagram, diamond is an insulator while graphite is a conductor. 6
- OR
- A) Answer the following : 6
- i) Write note on nuclear fission fuels.
  - ii) Discuss Bio-inorganic chemistry of iron.
4. B) Calculate Pauling's univalent radii of  $\text{Na}^+$  and  $\text{F}^-$  ion in NaF molecule. 4
- (Given : i) Internuclear distance,  $d = 2.31 \text{ \AA}$   
ii) Screening constant, (S) for Neon configuration is 4.5)
- OR
- B) Answer the following : 4
- i) Draw the crystal field splitting diagram for  $d^5$  weak and strong octahedral complexes.
  - ii) Explain the importance of carbonyl as a  $\pi$ -acid ligand in organometallic chemistry.



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T.Y. B.Sc. (Semester – IV) Examination, 2012  
CHEMISTRY (Paper – III)  
CH – 343 : Organic Chemistry  
(2008 Pattern) (New)

Time : 2 Hours

Max. Marks : 40

**N.B. :** i) *All questions are compulsory.*

ii) *Figures to the right indicate full marks.*

iii) *Draw structures and neat diagrams if necessary.*

iv) *IR, NMR and UV Spectroscopic data is given in Table - 1, 2 and 3 respectively.*

1. Answer the following :

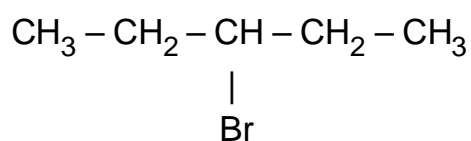
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- i) What is Friedel-Crafts acylation ?
- ii) Explain the term FGI with example.
- iii) What is coupling constant ?
- iv) Tertiary aromatic amines undergo diazo-coupling reaction at para position.  
Why ?
- v) What do you mean by reactive methylene group ?
- vi) Calculate fundamental modes of vibrations for chloroform.

P.T.O.



- vii) What are terpenoids ?
- viii) Explain  $n \rightarrow \pi^*$  transition with suitable example.
- ix) State special isoprene rule.
- x) How many types of protons are present in the following compound ?



2. A) Attempt **any two** of the following :

6

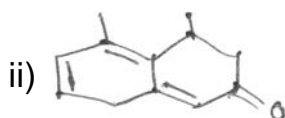
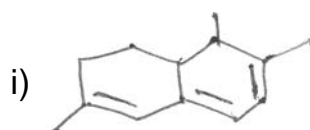
- i) Write retrosynthesis and synthesis for



- ii) What is Diazo-coupling reaction ? Explain its mechanism with suitable example.
- iii) Draw structure of Malonic ester. Explain any one of its synthetic application.

B) Calculate UV  $\lambda_{\text{max}}$  for the following .

4



OR

B) i) Explain Dieckmann cyclisation with suitable example.

2

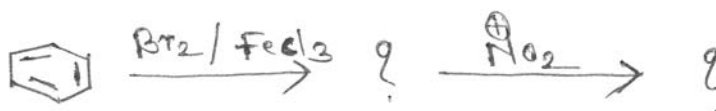
ii) Write the reactions to explain the presence of aldehydic group in citral.

2



3. Attempt **any two** of the following :

- A) i) Discuss the mechanism of sulphonation of benzene with points. **3**
- a) Generation of electrophile
  - b) Attack of electrophile
  - c) Abstraction of proton.
- ii) How will you prove the presence of – NHCH<sub>3</sub> in ephedrine ? **2**
- B) i) Explain Perkin's reaction with mechanism. **3**
- ii) Aniline shows hypsochromic shift in acidic medium. Explain. **2**
- C) i) What are the applications of IR spectroscopy ? **3**
- ii) Predict the products with justification. **2**



4. A) Propose structures for the compounds from the following spectroscopic data. Justify your answer (**any two**) : **6**
- i) M.F. – C<sub>4</sub>H<sub>8</sub>O
- UV :  $\lambda_{\text{max}} = 299 \text{ nm.}, 260 \text{ nm}$
- IR : 1715 cm<sup>-1</sup>.
- NMR : a) Triplet, 1.07  $\delta$  (3H)
- b) Singlet, 2.12  $\delta$  (3H)
- c) Quartet 2.48  $\delta$  (2H)



ii) M.F. –  $C_8H_{10}$

UV : 255 nm

IR : 1600, 750  $cm^{-1}$

NMR : a) 1.1  $\delta$  (Triplet, 3H)

b) 2.3  $\delta$  (Quartet, 2H)

c) 7.3  $\delta$  (Singlet, 5H)

iii) M.F. –  $C_7H_7Br$

UV : 250 nm, 288 nm

IR : 1510, 1620, 855  $cm^{-1}$ .

NMR : a) 2.3  $\delta$ , singlet (3H)

b) 7.2  $\delta$ , Doublet (2H)

c) 6.8  $\delta$ , Doublet (2H)

B) Write notes on '**any two**' :

4

i) Types of coupling.

ii) Aldol condensation.

iii) Aromatic Nucleophilic substitution.

OR





B) i) Give general properties of alkaloids. 2

ii) How will you distinguish following pair by IR spectroscopy? 2

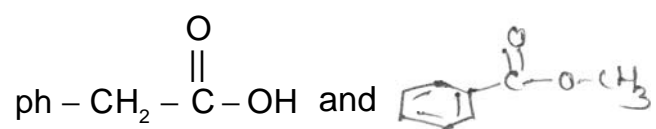




TABLE – 1  
Characteristic Infrared Absorptions of Functional Groups

GROUP	FREQUENCY RANGE $\text{cm}^{-1}$	INTENSITY
A. Alkyl		
C–H (stretching)	2853–2962	(m – s)
Isopropyl – $\text{CH}(\text{CH}_3)_2$	1380 – 1385	(s)
	and 1365 – 1370	(s)
tert – Butyl – $\text{C}(\text{CH}_3)_3$	1385 – 1395	(m)
	and – 1365	(s)
B. Alkenyl		
C–H (stretching)	3010 – 3095	(m)
C = C (stretching)	1620 – 1680	(v)
R–CH = $\text{CH}_2$	985 – 1000	(s)
	and 905 – 920	(s)
$\text{R}_2\text{C} = \text{CH}_2$	880 – 900	(s)
cis – RCH = CHR	(out of plane C–H bendings) 675 – 730	(s)
trans – RCH = CHR	960 – 975	(s)
C. Alkynyl		
$\equiv\text{C}$ –H (stretching)	– 3300	(s)
$\text{C}\equiv\text{C}$ (stretching)	2100 – 2260	(v)
D. Aromatic		
Ar – H (stretching)	– 3030	(v)
Aromatic substitution type (C–H out-of-plane bendings)		
Monosubstituted	690 – 710	(very s)
	and 730 – 770	(very s)
o – Disubstituted	735 – 770	(s)
m – Disubstituted	680 – 725	(s)
	and 750 – 810	(very s)
p – Disubstituted	800 – 840	(very s)
E. Alcohols, Phenols, Carboxylic Acids		
OH (alcohols, phenols, dilute solutions)		
OH (alcohols, phenols, hydrogen bonded)	3200 – 3550	(broad)
OH (carboxylic acids, hydrogen bonded)	2500 – 3000	(very broad)
F. Aldehydes, Ketones, Esters and Carboxylic Acids		
C = O stretch	1630 – 1780	(s)
aldehydes	1690 – 1740	(s)
ketones	1680 – 1750	(s)
esters	1735 – 1750	(s)
carboxylic acids	1710 – 1780	(s)
amides	1630 – 1690	(s)
G. Amines		
N – H	3300 – 3500	(m)
H. Nitriles		
$\text{C}\equiv\text{N}$	2220 – 2260	(m)
I. $\begin{array}{c}   \\ -\text{C}-\text{O} \\   \end{array}$ stretch (alcohol, ether, phenol)	1000 – 1300	(s)
J. Nitro $\text{N}=\text{O}$	1550 and 1350	(s)
K. Halides		
	F 1400 – 1000	(s)
	Cl 785 – 540	(s)
	Br < 667	(s)



TABLE – 2  
Approximate Proton Chemical Shifts in NMR

TYPE OF PROTON	CHEMICAL SHIFT, DELTA, PPM ( $\delta$ )		
1° Alkyl, RCH <sub>3</sub>	0.8 – 1.0		
2° Alkyl, RCH <sub>2</sub> R	1.2 – 1.4		
3° Alkyl R <sub>3</sub> CH	1.4 – 1.7		
Allylic, R <sub>2</sub> C = C – CH <sub>3</sub>   R	1.6 – 1.9	Ester R – C – O – CH <sub>2</sub> – R	4 to 4.5
		 O	
Benzylic, ArCH <sub>3</sub>	2.2 – 2.5		
Alkyl chloride RCH <sub>2</sub> Cl	3.6 – 3.8		
Alkyl bromide, RCH <sub>2</sub> Br	3.4 – 3.6		
Alkyl iodide, RCH <sub>2</sub> I	3.1 – 3.3		
Ether, ROCH <sub>2</sub> R	3.3 – 3.9		
Alcohol, HOCH <sub>2</sub> R	3.3 – 4.0		
Ketone, RCCH <sub>3</sub>    O	2.1 – 2.6	R – C – CH <sub>2</sub> –	2.4 $\delta$
		 O	
		R – C – CH –	2.5 $\delta$
		 O	
Aldehyde, RCH    O	9.5 – 9.6		
Vinylic, R <sub>2</sub> C = CH <sub>2</sub>	4.6 – 5.0		
Vinylic R <sub>2</sub> C = CH   R	5.2 – 5.7		
Aromatic, ArH	6.0 – 9.5		
Acetylenic, RC $\equiv$ CH	2.5 – 3.1		
Alcohol hydroxyl, ROH	0.5 – 6.0 <sup>a</sup>		
Carboxylic, RCOH    O	10 – 13 <sup>a</sup>		
Phenolic, ArOH	4.5 – 7.7 <sup>a</sup>		
Amino R– NH <sub>2</sub>	1.0 – 5.0		

<sup>a</sup>The chemical shifts of these groups vary in different solvents and with temperature and concentration.

TABLE – 3  
U.V. Absorption rules for diene chromophores

1) Parent	215 nm	6) – halogen	5 nm
2) Each extra conjugation	30 nm	7) – SR	30 nm
3) Homoannular	39 nm	8) – NR <sub>2</sub>	60 nm
4) Exocyclic double bond	05 nm	9) – OH, –OR	5 nm
5) Each alkyl (R) substituent directly attached to double bonded carbon	05 nm		

U.V. Absorption rules for Enone System

1) Parent	215 nm (207 nm for aldehyde) (202 nm for five membering)		
2) Each extra conjugation	30 nm	6) – Cl	$\alpha$ 15 nm
3) Homoannular	39 nm	7) – OH, – OR	$\beta$ 12 nm
4) Substituents		8) – SR	$\alpha$ 35 nm
a) Alkyl group at $\alpha$	10 nm	9) – NR <sub>2</sub>	$\beta$ 30 nm
b) Alkyl group at $\beta$	12 nm		$\beta$ 85 nm
c) Alkyl group at $\gamma$ , $\delta$ & higher	18 nm		$\beta$ 95 nm
5) Exocyclic double bond	05 nm		



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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**CHEMISTRY (Paper – V)**  
**CH – 345 : Industrial Chemistry (2008 Pattern) (New)**

Time : 2 Hours

Max. Marks : 40

- N.B.:** 1) **All questions are compulsory.**  
2) **Figures to the right indicate full marks.**  
3) **Draw neat diagrams and flowsheets wherever necessary.**

1. Answer the following : 10
- i) What is the composition of portland cement ?
  - ii) What is Borosilicate glass ?
  - iii) Define the term “colour”.
  - iv) What are cationic surfactants ?
  - v) Define the term “coke number”.
  - vi) What are antipyretics ? Give one example.
  - vii) What are uses of cement ?
  - viii) Define the term “cullet”.
  - ix) What are Amphipathic surfactants ?
  - x) What are tranquillizers ?
2. A) Answer the following (**any two**) : 6
- i) Discuss the chemical properties of glass.
  - ii) Write a brief note on “cleansing action of detergent”.
  - iii) Explain high temperature carbonisation (HTC) of coal.
- B) Answer the following (**any two**) : 4
- i) Write a brief note on “Reinforced concrete”.
  - ii) What are qualities of a good dye ?
  - iii) Explain Otto Witt’s theory of colour.

P.T.O.



3. Attempt **any two** of the following : **10**
- i) Describe the manufacture of glass by tank furnace with special reference to chemical reactions involved.
  - ii) Give the synthesis and uses of
    - i) Alizarin
    - ii) Rosaniline.
  - iii) What is a drug ? What are qualities of a good drug ? Give the classification of drugs.
4. A) Discuss the manufacture of ceramic articles with special reference to soft plastic forming and slip casting methods for the forming of ceramics. **6**
- OR
- A) What are liquid fuels ? Discuss the distillation of crude oil in detail.
- B) Describe the manufacturing of detergent with the help of flow sheet diagram. **4**
- OR
- B) What are Anesthetics ? Write the synthesis and uses of Benzocaine.



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T.Y. B.Sc. (Semester – IV) Examination, 2012  
CHEMISTRY (Paper – VI)  
CH-346 (A) : Nuclear Chemistry (Elective – II)  
(2008 Pattern) (New)

Time : 2 Hours

Max. Marks : 40

- Instructions:** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*  
3) *Draw the diagrams whenever necessary.*

1. Answer the following : 10
- a) The theory of nuclear fission is based on
    - i) shell model
    - ii) liquid drop model
    - iii) Thomson model
    - iv) Fermi model.
  - b) Define prompt and delayed neutrons.
  - c) State two limitations of Cockcroft-Walton accelerator.
  - d) State the principle of cyclotron accelerator.
  - e) Which are the two coolants used in nuclear reactors ?
  - f) The value of mass loss in nuclear fission comes to be around
    - i) 0.2 u
    - ii) 0.4 u
    - iii) 0.5 u
    - iv) 1.0 u
  - g) Which radioisotope is used to determine the age of wooden sample ?
  - h) State one method for the preparation of radioisotope  $^{131}\text{I}$ .
  - i) State the principle of isotope dilution analysis method.
  - j) Which are the two safety precautions taken while handling radioactive substances ?
2. A) Attempt **any two** of the following : 6
- a) Write short notes on fission energy.
  - b) Explain the principle and working of scintillation counter.
  - c) Write short notes on probing by isotopes.
- B) Answer **any two** of the following : 4
- a) State radiochemical principle in the use of tracers.
  - b) What are the biological effects of radiations ?
  - c) Write short notes on cow and milk system.

P.T.O.



3. Answer **any two** of the following : **10**
- a) Explain the principle and working of linear accelerator.
  - b) Define reproduction factor (K). Give the expression of four factor formula and explain the terms involved in it.
  - c) Explain the principle of neutron activation analysis. State its applications. What are the advantages of the method ?
4. A) Explain the process of nuclear fission. Explain mass and charge distribution for nuclear fission. **6**
- OR
- A) Describe the method of preparation of the following radioisotopes. **6**
- 1) Hydrogen - 3
  - 2) Carbon - 14
  - 3) Sodium - 22
- B) What are semiconductors ? State different types of semiconductor. Explain the principle and working of semiconductor detector. **4**
- OR
- B) Write short notes on Szilard-Chalmer reaction. **4**
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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**CHEMISTRY (Paper – VI)**  
**CH-346 (B) : Polymer Chemistry (Elective – II)**  
**(2008 Pattern) (New)**

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*  
3) *Draw diagrams wherever necessary.*

1. Answer the following : 10
- i) Define the term : Photostabilizers.
  - ii) What is meant by heterochain polymers ?
  - iii) Rubberball when cooled to  $-75^{\circ}\text{C}$  and when falls on hard surface breaks into pieces. Why ?
  - iv) Explain the term : Elastomer.
  - v) Write the correct structure of polyvinyl acetate.
  - vi) Define the term: sizing.
  - vii) Mention the important IR-bands of polyacryloamide.
  - viii) Explain the term : Fibre spinning.
  - ix) Whether the following statement is **true** or **false** :  
Vulcanized process always give linear polymer.
  - x) Give two important uses of epoxy polymers.
2. A) Attempt **any two** of the following : 6
- i) Explain the factors affecting on glass transition temperature.
  - ii) Give brief account of optical isomerism in polymers.
  - iii) Write a note on : Photodegradation of polymers.
- B) Answer the following (**any two**) : 4
- i) T<sub>g</sub> of polystyrene is  $100^{\circ}\text{C}$  and poly- $\alpha$ -methyl styrene is  $170^{\circ}\text{C}$ . Explain.
  - ii) Define the terms :  
a) Transparency    b) Haze
  - iii) Explain in brief a degree of crystallinity in polymers.
3. Attempt **any two** of the following : 10
- i) Give a detailed account of differential scanning calorimeter (DSC) method for analysis of polymers.
  - ii) Describe the method of preparation, properties and uses of –  
a) Phenol-formaldehyde resin  
b) Polypropylene.
  - iii) Give a detailed account of conducting polymers.
4. A) Attempt **any two** of the following : 6
- i) Describe film casting technique in polymer technology.
  - ii) Write a note on extrusion process in polymer processing.
  - iii) Give a brief account of blow moulding process.
- B) Explain the term – fiber spinning and give detailed account of dry spinning process. 4
-





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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**CHEMISTRY (Paper – VI) (Elective – II)**  
**CH-346 (C) : Biochemistry**  
**(Introduction to Biochemistry and Molecular Biology)**  
**(2008 Pattern) (New)**

Time : 2 Hours

Max. Marks : 40

**Instructions :** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*  
3) *Neat diagrams must be drawn wherever necessary.*

- I. Answer the following : 10
- 1) Define anabolism.
  - 2) Write the reaction for conversion of succinate to fumarate.
  - 3) Give the transamination reaction of aspartate.
  - 4) Define nucleosides.
  - 5) What is AUG ?
  - 6) Define phosphodiester bond.
  - 7) Name the sugars in DNA and RNA and give their structures.
  - 8) Define transcription.
  - 9) List out two functions of ATP.
  - 10) What is the role of DNA binding protein in replication ?
- II. A) Attempt **any two** of the following : 4
- 1) How is pyruvate converted to ethanol ?
  - 2) Enlist the components of ETC.
  - 3) Write the complementary antiparallel ribonucleotide strand of the nucleotide sequence ATGCCAG.
- B) Answer **any two** of the following : 6
- 1) Draw the clover leaf model of tRNA and give features.
  - 2) Write note on conversion of Pyruvate to AcetylcoA.
  - 3) Give short account of oxidative deamination.
- III. Answer the following (**any two**) : 10
- 1) Discuss the salient features of genetic code.
  - 2) Explain the transport of fatty acids from cytosol to mitochondria.
  - 3) Elaborate on Meselson and Stahl experiment and its interpretation.
- IV. 1) Explain in detail Watson and Crick model of DNA. 6
- OR
- 1) Describe initiation, elongation and termination of translation.
  - 2) Write note on (**any one**) : 4
- a) Synthesis of leading and lagging strand in DNA replication.
  - b) Payoff phase of glycolysis.
- \_\_\_\_\_



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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**CHEMISTRY (Paper – VI) (Elective – II)**  
**CH-346 (D) : Environmental Chemistry**  
**(2008 Pattern) (New)**

Time : 2 Hours

Max. Marks : 40

**Instructions :** i) *All questions are compulsory.*  
ii) *Figures to the right indicate full marks.*  
iii) *Neat diagrams must be drawn wherever necessary.*

1. Answer the following in short : **10**
- i) What is the primary treatment to the waste water ?
  - ii) What is pyrolysis ?
  - iii) Define Chemiluminescence.
  - iv) Mention the most commonly used detectors used in HPLC.
  - v) What is the composition of soda glass used in glass electrode ?
  - vi) What is gasohol ?
  - vii) Mention the sources of CO<sub>2</sub> gas in atmosphere.
  - viii) Define ozonosphere.
  - ix) What is sludge digestion ?
  - x) Explain the term radiative forcing.
2. a) Attempt **any two** of the following : **6**
- i) Explain the use of ion exchanger in water softening.
  - ii) Ozone layer acts as a protective layer for the life on the earth – explain.
  - iii) Explain the method of determination of lead spectrophotometrically.
- b) Write short notes on **any two** of the following : **4**
- i) Green house gases.
  - ii) Chlorofluorocarbons.
  - iii) Nuclear fission.



3. Attempt **any two** of the following : **10**

- i) Explain the ultrafiltration technique used in industrial waste water treatment.
- ii) Describe dihydrogen-dioxygen fuel cell.
- iii) Explain the principle and working of electron capture detector.

4. a) Describe the principle and working of AAS. **6**

OR

Describe anaerobic sludge bed treatment for purification of waste water.

b) Write short note on **(any one)** : **4**

- i) Global warming
  - ii) Ozone depletion.
-



Seat No.	
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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**CHEMISTRY (Paper – VI) (Elective – II)**  
**CH-346 (E) : Dairy Chemistry**  
**(2008 Pattern) (New)**

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*  
3) *Neat diagrams must be drawn wherever necessary.*

1. Answer the following :

10

- i) Define 'Solids not fat'.
- ii) Define "Developed acidity".
- iii) What do you mean by platform test ?
- iv) What do you mean by soft curd milk ?
- v) Define "essential amino acids".
- vi) Define 'preservation of milk'.
- vii) What do you mean by neutralisation of cream ?
- viii) Define 'renetting'.
- ix) What is whey powder ?
- x) What do you mean by clarification of milk ?



2. A) Answer **any two** of the following : 6
- i) Discuss about milk and public health.
  - ii) 'Milk is almost an ideal food'. Explain.
  - iii) Discuss 'Irradiated milk'.
- B) Answer **any two** of the following : 4
- i) Give methods of detection of adulterants.
  - ii) Write note on 'chocolate milk'.
  - iii) Give advantages of dried milk products.
3. A) Classify the proteins with suitable example. 5
- OR
- A) Describe the flow sheet diagram for manufacture of flavoured milk. 5
- B) Describe manufacture of cream with flow sheet. 5
- OR
- B) Compare glass bottle and paper (film) packing of milk. 5
4. A) Answer **any two** of the following : 6
- i) How will you test the presence of formalin and boric acid in milk sample ?
  - ii) Define baby milk powder. Give its composition and nutritive value.
  - iii) Discuss about vitamin B<sub>12</sub>.
- B) Write notes on **(any two)** : 4
- i) Standardization of milk.
  - ii) Milk sugar.
  - iii) Pasteurizing processes.



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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**BOTANY (Paper – I)**  
**BO – 341 : Plant Physiology and Biochemistry**  
**(New Course) (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- N.B.:** i) *All questions are compulsory.*  
ii) *Draw neat labelled diagrams wherever necessary.*  
iii) *Figures to the right indicate full marks.*

1. Answer the following : **10**
- a) Enlist any two accessory pigments of photosynthesis.
  - b) What is anaerobic respiration ?
  - c) Define diffusion of organic solutes.
  - d) Define seed dormancy.
  - e) What are biotic stresses ?
  - f) State first law of thermodynamics.
  - g) Define amino acids.
  - h) What are monosaccharides ?
  - i) What are lipids ?
  - j) What are secondary metabolites ?
2. Attempt **any two** of the following : **10**
- a) Give an outline of HSK pathway. Add a note on its significance.
  - b) Explain cyclic photophosphorylation and give its significance.
  - c) Give the properties of amino acids.

P.T.O.



3. Write notes on (**any two**) : **10**
- a) Munch hypothesis
  - b) Classification of carbohydrates
  - c) Functions of lipids.
4. What is aerobic respiration ? Give an outline of TCA cycle and explain its various reactions. **10**

OR

What are enzymes ? Explain lock and key hypothesis of enzyme action and add a note on factors affecting enzyme activity. **10**

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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**BOTANY (Paper – II)**  
**BO – 342 : Plant Pathology**  
**(2008 Pattern) (New)**

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) *All questions are compulsory.*  
2) *Neat labelled diagrams must be drawn wherever necessary.*  
3) *Figures to the right indicate full marks.*

1. Answer the following : **10**
- a) What is Penetration ?
  - b) Define incubation.
  - c) Give two names of nematodal diseases.
  - d) Define resistance.
  - e) Give two symptoms of club root of crucifer.
  - f) Give the name of causal organism of downy mildew.
  - g) Give two control measures of grassy shoot of sugarcane.
  - h) What is IARI ?
  - i) Define inoculum.
  - j) What is eradication ?
2. Attempt **any two** of the following : **10**
- a) Give salient features of ICRISAT.
  - b) Explain chemical control of plant disease.
  - c) Describe tobacco mosaic disease.

P.T.O.





3. Write notes on **any two** of the following : **10**

a) Types of media.

b) Contribution of Anton Bary.

c) Monoclonal antibodies.

4. What is disease cycle ? Explain steps involved in disease cycle. **10**

OR

Give an account of leaf spot of turmeric and black arm of cotton with reference to causal organisms, symptoms and control measures. **10**

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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**BOTANY (Paper – III)**  
**BO – 343 : Pteridophytes, Gymnosperms and Paleobotany**  
**(2008 Pattern) (New)**

Time : 2 Hours

Max. Marks : 40

**Instructions:** i) *All questions are compulsory.*  
ii) *Draw neat labelled diagrams where necessary.*  
iii) *Figures to the right indicate full marks.*

1. Answer the following : **10**
- a) What are the functions of scaly leaves in gymnosperms ?
  - b) Give any two characters of Rhynia.
  - c) Define pycnoxylic wood.
  - d) Write any two economic importance of Gymnosperms.
  - e) Write any two importance of heterospory.
  - f) Which era is called as era of modern life ?
  - g) What are the uses of geological time scale ?
  - h) What do you mean by actinostele ?
  - i) Write any two salient features of class psilopsida.
  - j) Define sprophyll.
2. Attempt **any two** of the following : **10**
- a) Sketch, label and describe T.g. of Equisetum stem.
  - b) Draw, label and describe morphological characters of Lepidocarpon.
  - c) Sketch, label and describe male cone of Gnetum.

P.T.O.



3. Write notes on **any two** of the following : **10**

a) T.S. of Marsilea rhizome.

b) Calamostachys.

c) Female cone of Pinus.

4. Define Fossil. Give an account of different types of Fossils studied by you. **10**

OR

With the help of labelled diagram, describe the internal structure of Gnetum stem. **10**

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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**BOTANY (Paper – IV)**  
**BO-344 : Plant Biotechnology**  
**(New Course) (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- N.B. :** i) *All questions are **compulsory**.*  
ii) *Draw **neat** labelled diagrams **wherever** necessary.*  
iii) *Figures to the **right** indicate **full** marks.*

1. Answer the following : **10**
- a) Define biotechnology.
  - b) Enlist levels of biodiversity.
  - c) State Lambert's law.
  - d) What is a database ?
  - e) What is a Nif gene ?
  - f) Name any two symbiotic nitrogen fixers.
  - g) Define cryopreservation.
  - h) What is VAM ?
  - i) What are cybrids ?
  - j) What are edible vaccines ?

**P.T.O.**



2. Attempt **any two** of the following : **10**
- a) Describe in brief the technique of Agarose gel electrophoresis.
  - b) Write short note on NCBI.
  - c) What are the benefits of Biofertilizers ?
3. Write note on **any two** of the following : **10**
- a) Use of bioinformatics tools in analysis.
  - b) Transgenic plants for molecular farming.
  - c) Types of proteomics.
4. What are DNA modifying enzymes ? Discuss their mode of action. **10**

OR

What is protoplast culture ? Describe any one method of isolation of protoplast. **10**



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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**BOTANY (Paper – V)**  
**BO-345 : Botanical Techniques**  
**(New) (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- N.B. :** i) *All questions are compulsory.*  
ii) *Draw well labelled diagrams wherever necessary.*  
iii) *Figures to the right indicate full marks.*

1. Answer the following : 10
- a) Define radioisotopes.
  - b) What is dispersion of light ?
  - c) Define relative centrifugal force.
  - d) What is pH ?
  - e) Mention the types of camera lucida.
  - f) What is X ray microanalysis ?
  - g) Write the principle of TLC.
  - h) What is smear ?
  - i) Write any two applications of spectrophotometer.
  - j) Name the killing agent used in microtomy.
2. Attempt **any two** of the following : 10
- a) What is stain ? Explain nature and use of hematoxyline and Safranin.
  - b) Write advantages of digital camera.
  - c) Explain Beer and Lambert's law.

P.T.O.



3. Write notes on **any two** of the following : **10**
- a) Paper chromatography.
  - b) Calibration of ocular micrometer.
  - c) Resolving power of microscope.

4. Describe construction, working and optic principle of compound microscope. **10**

OR

4. What is acropalynology ? Describe working of rotorod sampler. **10**
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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**BOTANY (Paper – VI)**  
**BO – 346 : Pharmacognosy**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- Instructions :** i) **All questions are compulsory.**  
ii) **Draw neat labelled diagrams wherever necessary.**  
iii) **Figures to the right indicate full marks.**

1. Answer the following : **10**
- a) What is meant by crude drug ?
  - b) Who is the founder of Homeopathic system of medicine ?
  - c) Enlist tridoshas.
  - d) Give two types of rasa.
  - e) Define drug adulteration.
  - f) Give two advantages of drug processing.
  - g) What is active principle of Adulsa ?
  - h) Give the planting material used in Isabgol.
  - i) Give two medicinal uses of gum.
  - j) Define Ethnobotany.
2. Attempt **any two** of the following : **10**
- a) Give an account of history of Pharmacognosy.
  - b) Comment on cosmeceuticals.
  - c) Explain chemical evaluation of drugs.

P.T.O.





3. Write short notes on **any two** of the following : **10**
- a) Ayurvedic formulation – Churna
  - b) Storage of crude drugs
  - c) Aims and objectives of Ethnobotany.
4. Give an account of source, cultivation, microscopic characters, chemical constituents and medicinal uses of Aloe. **10**

OR

Give source, microscopic character, chemical constituents and medicinal uses of Myristica. **10**

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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**ZOOLOGY (Paper – I)**  
**ZY – 341 : Biotechnology**  
**(2008 Pattern) (New)**

Time : 2 Hours

Max. Marks : 40

- N.B. :** i) *All questions are compulsory.*  
ii) *Neat labelled diagrams must be drawn wherever necessary.*  
iii) *Figures to right indicate full marks.*

1. Attempt the following : 10
- 1) Define plasmid.
  - 2) What is hybridoma technology ?
  - 3) Define biosensors
  - 4) What is lipofection ?
  - 5) Give any one importance of animal tissue culture.
  - 6) Define tissue culture.
  - 7) What are restriction enzymes ?
  - 8) What is southern blotting ?
  - 9) What is antigen ?
  - 10) Define hydroponics.
2. Attempt **any two** of the following : 10
- 1) Describe PCR technique.
  - 2) Sketch and label ideal fermenter.
  - 3) Describe ELISA technique.

P.T.O.



3. Write short notes on **any two** of the following : **10**

- a) Division of stem cell.
- b) Microbial pesticide.
- c) Advantages and disadvantages of Animal tissue culture.
- d) Characteristic of transformed cell.

4. What is recombinant DNA technology ? Write note on cloning vector. **10**

OR

What are monoclonal antibodies ? Write method of production of transgenic animals.

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Seat No.	
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**T.Y.B.Sc. (Semester – IV) Examination, 2012**  
**ZOOLOGY (Paper – II)**  
**ZY – 342 : Mammalian Physiology and Endocrinology**  
**(New) (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- N.B :** 1) *All questions are compulsory.*  
2) *Neat and labelled diagrams must be drawn wherever necessary.*  
3) *Figures to the right indicate full marks.*

1. Attempt the following : 10
- 1) What is metabolism ?
  - 2) What is a stimulus ?
  - 3) Define Sarcomere.
  - 4) What are mineralocorticoids ?
  - 5) Define decarboxylation.
  - 6) What is pacemaker ?
  - 7) What is dyspnoea ?
  - 8) Define glycogenesis.
  - 9) What is pregnancy ?
  - 10) Define BMR.
2. Attempt **any two** of the following : 10
- i) Describe the process of  $\beta$ -oxidation of fatty acids.
  - ii) Explain the mechanism of transport of oxygen during respiration.
  - iii) Describe the events in synaptic transmission.

P.T.O.



3. Write short notes on **any two** of the following : **10**
- a) Clinical significance of angiography and angioplasty.
  - b) Rigor mortis
  - c) ETS
  - d) Glomerular ultrafiltration.
4. What are hormones ? Describe hormones secreted by pituitary gland. **10**

OR

What is menstruation ? Describe in detail various phases of menstrual cycle.  
Write a note on hormonal control of menstruation.

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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**ZOOLOGY (Paper – III)**  
**ZY-343 : Molecular Biology**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- N.B :** 1) *All questions are compulsory.*  
2) *Draw neat labelled diagrams wherever necessary.*  
3) *Figures to the right indicate full marks.*

1. Attempt the following :

10

- 1) What is central dogma of Molecular Biology ?
- 2) What is hypochromic effect ?
- 3) What is Minichromosome ?
- 4) Define Nucleoside.
- 5) What is leading strand ?
- 6) What is genetic code ?
- 7) Mention types of RNA.
- 8) Define function of enzyme DNA polymerase I.
- 9) Define Primer.
- 10) Mention radio active elements used by Harshey and Chase.

P.T.O.



2. Attempt **any two** of the following : **10**
- i) Explain the structure of t-RNA.
  - ii) Describe the structure of ribosome.
  - iii) Explain the role of three enzyme in Lac operon.
3. Write **any two** of the following : **10**
- a) Mechanism of DNA damage by 2 chemical agents.
  - b) Cloning vector.
  - c) Structure of Nucleosome.
  - d) Attenuation.
4. What is transcription ? Explain the steps involved in the process of transcription. **10**

OR

Explain Griffith's experiment and add a note on mechanism of transformation.

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**T.Y. B.Sc. (Semester – IV) Examination, 2012  
ZOOLOGY (Paper – VI)  
ZY-346 : Genetics and Development Biology  
(2008 Pattern ) (New)**

Time : 2 Hours

Max. Marks : 40

- N.B. :*** 1) ***All questions are compulsory.***  
2) ***Neat labelled diagrams must be drawn wherever necessary.***  
3) ***Figures to the right indicate full marks.***

1. Attempt the following .

10

- 1) What are alleles ?
- 2) State Hardy-Weinber formula.
- 3) What do you mean by cytoplasmic inheritance ?
- 4) Define primitive streak.
- 5) Define fertilization.
- 6) What is euphenics ?
- 7) Define gene pool.
- 8) Name any two animals which shows regeneration.
- 9) What is hydrid individual ?
- 10) What is apopotosis ?

P.T.O.





2. Attempt **any two** of the following : **10**

- 1) What is cloning ? Explain its importance.
- 2) Describe different types of eggs on the basis of distribution of yolk.
- 3) Explain the mechanism of isolation and sequencing of genes.

3. Write notes on **any two** : **10**

- i) Organizer in frog
- ii) Inbreeding and out breeding
- iii) Spermatogenesis
- iv) Restriction endonuclease.

4. What is mutation ? Explain any four types of mutations with suitable examples. **10**

OR

Describe 24 hours of chick embryo with suitable diagram. **10**

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Seat  
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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**GEOLOGY (Paper – I)**  
**GL-341 : Metamorphic Petrology**  
**(2008 Pattern) (New)**

Time : 2 Hours

Max.Marks : 40

- Instructions :** 1) **All** questions are **compulsory**.  
2) **All** questions carry **equal** marks.  
3) **Black figures to the right** indicate **full** marks.  
4) **Neat diagrams must be drawn wherever** necessary.

1. Answer in **2/3** lines :

**10**

- a) Define metamorphism.
- b) What are aureoles of thermal metamorphism ?
- c) What are slaty cleavages ?
- d) What is foliation ?
- e) Which structure is shown by the rocks which have undergone plutonic metamorphism ?
- f) What is metasomatism ?
- g) What are charnockites ?
- h) Name any two metamorphic minerals.
- i) What is granulose structure ?
- j) What is decussate structure ?

P.T.O.



2. Answer **any two** of the following : **10**
- a) Domain of metamorphism.
  - b) Barrovian zones of regional metamorphism.
  - c) Diagnostic structures of retrogressively metamorphosed rocks.
3. Answer **any two** of the following : **10**
- a) Textural evidences of metasomatism
  - b) Stress and metamorphic chemical reaction
  - c) Metamorphic facies.
4. Describe the effects of regional metamorphism on igneous rocks. **10**

OR

Describe in detail the process of attainment of chemical equilibrium in thermal metamorphism.

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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**GEOLOGY (Paper – III)**  
**GL – 343 : Economic Geology**  
**(2008 Pattern) (New)**

Time : 2 Hours

Max. Marks : 40

- Instructions :**
- 1) **All questions are compulsory.**
  - 2) **All questions carry equal marks.**
  - 3) **Black figures to the right indicate full marks.**
  - 4) **Neat diagrams must be drawn wherever necessary.**

1. Answer in **2/3** lines.

**10**

- a) Define ore.
- b) What is dissemination ?
- c) What is overburden ?
- d) What are beach placer deposits ?
- e) Give 2 localities of bauxite deposits in Maharashtra.
- f) State the chief ore minerals of silver.
- g) What is coal ?
- h) Name the two surface indicators of petroleum.
- i) Give the composition of limonite.
- j) State the ore minerals of chromite.

P.T.O.



2. Answer **any two** of the following : **10**
- a) Mineral deposition from groundwater.
  - b) Indigenous and transported limonite.
  - c) Uses of uranium and thorium.
3. Answer **any two** of the following. **10**
- a) Types of geothermal energy.
  - b) Raniganj coal field.
  - c) Geological and geographical distribution of petroleum.
4. Give the mineralogy, geological and geographical distribution and uses of lead and zinc mineral deposits. **10**

OR

What are hydrothermal deposits ? Explain the following cavity filling deposits.

- a) Stockworks
- b) Ladder vein
- c) Pitches and flats.



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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**GEOLOGY (Paper – V) (2008 Pattern)**  
**GL-345 : Phanerozoic Stratigraphy of India and Palaeontology**

Time : 2 Hours

Max. Marks : 40

- Instructions :**
- 1) **All** questions are **compulsory**.
  - 2) **All** questions carry **equal** marks.
  - 3) **Black figures** to the **right** indicate **full** marks.
  - 4) **Neat** diagrams must be drawn **wherever** necessary.

1. Answer the following in **2/3** lines : **10**
  - a) Give the type locality of Devonian system.
  - b) Give age of Deccan Traps.
  - c) Give lithology of Lameta Group.
  - d) Give characteristics of marine transgressions.
  - e) Give geographical distribution of Siwaliks.
  - f) Give economic importance of Damuda Group.
  - g) Give systematic classification of Ptilophyllum.
  - h) Give classification of laterites.
  - i) Name the important flora of upper Gondwanas.
  - j) Write the formations of Jurassic of Kutch.
  
2. Write notes on **(any two)** : **10**
  - a) Tectonic and life during Mesozoic Era.
  - b) Cambrian system.
  - c) Classification of Gondwana Supergroup.

P.T.O.



3. Write notes on **(any two)** :

**10**

a) Bagh beds

b) Carboniferous of Spiti

c) Stratigraphy of Maharashtra.

4. Give detailed account of geographical distribution, petrological characters and classification of Deccan Traps/ Deccan Volcanic Province.

OR

What is mass extinction ? Write about major mass extinctions during phanerozoic con. Explain in details the causes of mass extinction.

**10**

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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**GEOLOGY (Paper – VI)**  
**GL 346 : Applied Geology – II**  
**(Engineering Geology, Geohydrology and Prospecting)**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) **All** questions are **compulsory**.  
2) **All** questions carry **equal** marks.  
3) **Black** figures to the **right** indicate **full** marks.  
4) **Neat** diagrams must be drawn **wherever** necessary.

1. Answer the following in **2/3** lines :

**10**

- a) Give uses of rock aggregates.
- b) Define engineering geology.
- c) Define residual stress in rocks.
- d) Explain the term spillway.
- e) What is perched aquifer ?
- f) Name two methods of artificial recharge of ground water.
- g) What is water table ?
- h) What is tortion balance ?
- i) Define the term prospecting.
- j) What are lithologic guides ?

P.T.O.





2. Write notes (**any two**) : **10**
- a) Rainwater harvesting
  - b) Tunnels in folded rocks
  - c) Fracture patterns as guides.
3. Write notes (**any two**) : **10**
- a) Gravity dam
  - b) Path finders
  - c) Hydrologic cycle
4. Enumerate different engineering properties of rocks. Explain the compressive strength, tensile strength and elasticity of rocks. **10**

OR

4. Explain vertical distribution of groundwater. Add a note on conservation of groundwater. **10**
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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**STATISTICS (Principal) (Paper – I)**  
**ST-341 : Distribution Theory – II**  
**(2008 Pattern) (New Course)**

Time : 2 Hours

Max. Marks : 40

- Instructions :**
- 1) **All questions are compulsory.**
  - 2) **Figures to the right indicate full marks.**
  - 3) **Use of scientific calculator and statistical tables is allowed.**
  - 4) **Symbols and abbreviations have their usual meaning.**

1. Attempt each of the following :

a) In each of the following cases choose the correct alternative : **(1 each)**

i) If X and Y are i.i.d. C(0,1) variates, then the distribution of  $\frac{1}{X} + \frac{1}{Y}$  is

- A) C(0, 2)      B) C (0, 1)      C) C(1,0)      D) C(0,  $\frac{1}{2}$ )

ii) If  $X \sim \text{LN}(a, \mu, \sigma^2)$  then median of X is

- A)  $a + e^{\mu+\sigma}$       B)  $a + e^{\mu}$       C)  $a + e^{\mu-0.67\sigma}$       D)  $a + e^{\mu+0.67\sigma}$

iii) If  $(X, Y) \sim \text{BN}(3, 1, 25, 16, 0.4)$ , then  $E(X/Y = -3)$  is

- A) 0.5      B) 5.5      C) 1      D) 7.5

iv) If X and Y are i.i.d. exponential variates with mean  $\frac{1}{\lambda}$ , then distribution of

X–Y is

- A) L( $\lambda, 0$ )      B) C(0,  $\lambda$ )      C) C( $\lambda, 0$ )      D) L(0,  $\lambda$ )

P.T.O.



b) State whether each of the following statements is **true** or **false** : (1 each)

i) Coefficient of Kurtosis for Laplace distribution with parameters  $\mu$  and  $\lambda$  is 3.

ii) For a Stochastic matrix row sums are always equal to 1.

c) i) Let  $X \sim B(n, p)$ . If the distribution of  $X$  is truncated to the left at  $X = 0$ , state the p.m.f. of the resulting distribution. 1

ii) State the nature of probability curve of Cauchy distribution. 1

d) Define the following : (1 each)

i) State space of a Markov chain ii)  $n$  step transition probability.

2. Attempt **any two** of the following : (5 each)

a) Let  $X \sim L(\mu, \lambda)$ . Find the cumulant generating function of  $X$  and hence obtain the first four cumulants.

b) Let  $X \sim LN(a, \mu, \sigma^2)$ . Derive  $r^{\text{th}}$  moment about  $X = a$ .

c) Let  $X \sim N(\mu, \sigma^2)$ . If the distribution of  $X$  is truncated to the right above  $b$ , state the p.d.f. of resulting distribution and derive its mean.

3. Attempt **any two** of the following :

a) i) State and prove the relation between Cauchy and uniform distribution. 3

ii) Give an application of truncated binomial distribution. 2

b) Let  $(X, Y) \sim BN(0, 0, 1, 1, \rho)$ . Obtain distribution of  $U = \frac{X}{Y}$ . 5

c) i) Let  $X \sim P(m)$ . If the distribution of  $X$  is left truncated at  $X = 0$ , state the p.m.f. and variance of resulting distribution. 2

ii) Consider a gambler who, at each play of the game, either wins Re 1/- with probability  $p$  or loses Re 1/- with probability  $1-p$ . Assuming that the gambler quits playing either when he goes broke or he attains a fortune of  $N$  Rs./-, write down the state space and transition probability matrix of the gambler's fortune. 3



4. Attempt **any one** of the following :

a) i) Let  $(X, Y) \sim \text{BN}(\mu_2, \mu_1, \sigma_1^2, \sigma_2^2, \rho)$ . Obtain the distribution of  $aX + bY + C$ . **6**

ii) State the distribution of  $Y = \prod_{i=1}^n X_i$ , where  $X_i \sim \text{i.i.d. LN}(0, \mu, \sigma^2)$ . Also find  $P(Y < 4)$  for  $n = 8, \mu = 3, \sigma^2 = 1$ . **4**

b) i) Let  $\{X_n, n \geq 0\}$  be a Markov chain with state space  $S = \{0, 1, 2\}$  and initial probability distribution  $P[X_0 = i] = \frac{1}{3}, i = 0, 1, 2$ .

If one step transition probability matrix of the above Markov chain is given by

$$P = \begin{bmatrix} 0.1 & 0.4 & 0.5 \\ 0.4 & 0.3 & 0.3 \\ 0.3 & 0.4 & 0.3 \end{bmatrix}$$

Compute :

I)  $P[X_2 = 2, X_1 = 1, X_0 = 1]$

II)  $P[X_2 = 1 | X_0 = 0]$

III)  $P[X_2 = 2, X_0 = 0]$  **7**

ii) If  $X_1, X_2, \dots, X_n$  is a random sample from Cauchy distribution with parameters  $\mu$  and  $\lambda$ . State the distribution of sample mean  $\bar{X}$  and comment on its limiting distribution. **3**



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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**STATISTICS (Principal) (Paper – II)**  
**ST – 342 : Testing of Hypotheses**  
**(2008 Pattern) (New Course)**

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) **All** questions are **compulsory**.  
2) Figures to the **right** indicate **full** marks.  
3) Use of scientific calculator and statistical tables is **allowed**.  
4) Symbols and abbreviations have their **usual** meaning.

1. Attempt **each** of the following :

a) In **each** of the following cases, choose the correct alternative : **(1 each)**

i) Probability of rejecting  $H_0$  when it is not true is called as

- A) Level of significance                      B) Size of the test  
C) Power of the test                          D) Power function

ii) In LRT,  $\lambda(x)$  is defined as

- A)  $\frac{\sup L(\theta_0/x)}{\sup L(\theta_1/x)}$                       B)  $\frac{\sup L(\theta_0/x)}{\sup L(\theta/x)}$   
C)  $\frac{\sup L(\theta_0/x)}{\inf L(\theta_0/x)}$                       D)  $\frac{\sup L(\theta_1/x)}{\sup L(\theta_0/x)}$

iii) In a SPRT of strength  $(\alpha, \beta)$

- A)  $A = \frac{1-\beta}{\alpha}$  and  $B = \frac{\beta}{1-\alpha}$                       B)  $A = \beta/\gamma$  and  $B = \alpha/\beta$   
C)  $A = \frac{\alpha}{1-\beta}$  and  $B = \frac{1-\alpha}{\beta}$                       D)  $A = \frac{1-\beta}{\alpha}$  and  $B = \frac{1-\beta}{1-\alpha}$

iv) Which of the following tests can be compared with chi-square test ?

- A) Run    B) Sign  
C) Man-Whitney                                D) Kolmogrov-Smirnov

P.T.O.



- b) In **each** of the following cases, state whether the given statement is **true** or **false** : **(1 each)**
- i) MP test is used for testing a simple null hypothesis against a composite alternative hypothesis.
  - ii) SPRT is a non parametric test.
- c) Define **each** of the following : **(1 each)**
- i) Level of significance (l.o.s.)
  - ii) Composite hypothesis.
- d) Attempt **each** of the following : **(1 each)**
- i) State the asymptotic distribution of  $-2 \log_e \lambda(x)$ .
  - ii) Is the sum of probabilities of type I and type II errors always 1 ? Justify your answer.

2. Attempt **any two** of the following : **(5 each)**

- a) Let  $X$  be a r.v. with probability mass function  $f_0$  under the null hypothesis and  $f_1$  under the alternative hypothesis.

<b>x</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
$f_0$	0.01	0.02	0.03	0.05	0.07	0.05	0.77
$f_1$	0.03	0.09	0.10	0.10	0.20	0.18	0.30

- i) Write all critical regions of size  $\alpha = 0.10$
  - ii) Among all critical regions listed in (i), which one has the maximum power ?
- b) Construct SPRT of strength  $(\alpha, \beta)$  for testing  $H_0 : \theta = \theta_0$  against  $H_1 : \theta = \theta_1$  ( $\theta_1 > \theta_0$ ) for an exponential distribution with mean  $\frac{1}{\theta}$ .
- c) Let  $X_1, X_2, \dots, X_{20}$  be a random sample of size 20 from Poisson distribution with mean  $m$ . Find uniformly most powerful critical region (UMPCR) of level 0.04 to test  $H_0 : m = \frac{1}{10}$  against  $H_1 : m > \frac{1}{10}$ .



3. Attempt **any two** of the following : **(5 each)**

a) Describe Wilcoxon Signed Rank Test.

b) Construct LRT of l.o.s.  $\alpha$  for testing  $H_0 : \mu = \mu_0$  against  $H_1 : \mu \neq \mu_0$  where  $\mu$  is the mean of  $N(\mu, \delta^2)$  distribution,  $\delta^2$  being unknown.

c) The following sequence of “left handers” (L) and “right handers” (R) was observed in a group of 20 students :

R R R R R L R L L R R R R L L L R R R R

Test for the randomness of the above sequence at 5% l.o.s.

4. Attempt **any one** of the following :

a) i) Let  $X_1, X_2, \dots, X_n$  be a r.s. from Bernoulli distribution with parameter  $\theta$ . Find BCR of size  $\alpha$  for testing  $H_0 : \theta = \theta_0$  against  $H_1 : \theta = \theta_1$  ( $\theta_1 < \theta_0$ ). **4**

ii) Following arrival times of 5 randomly selected employees were recorded on a “biometric machine”.

7:25, 7:30, 7:39, 7:23, 7:35

Test whether the observations can be considered as a random sample from  $U(7:20, 7:40)$ . Use 5% l.o.s. **6**

b) i) Explain Man-Whitney test. **5**

ii) Let  $X_1, X_2, \dots, X_n$  be a r.s. from  $N(\mu, \delta^2)$   $\mu$  known. Construct an UMP test of level  $\alpha$  for testing  $H_0 : \delta^2 = \delta_0^2$  against  $H_1 : \delta^2 > \delta_0^2$ . **5**







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Seat No.	
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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**STATISTICS (Principal) (Paper – III)**  
**ST-343 : Statistical Process Control (Offline Methods)**  
**(2008 Pattern) (New Course)**

Time : 2 Hours

Max. Marks : 40

- Instructions :**
- i) **All questions are compulsory.**
  - ii) **Figures to the right indicate full marks.**
  - iii) **Use of scientific calculators and statistical tables is allowed.**
  - iv) **Symbols and abbreviations have their usual meaning.**

1. Attempt **each** of the following : **(1 each)**

a) In each of the following cases, choose the correct alternative :

i) In a single a sampling plan  $n = 10$ ,  $N = 100$ ,  $ATI = 20$ , probability of acceptance of lot

- A) 0.8                      B) 0.9                      C)  $\frac{8}{9}$                       D)  $\frac{1}{9}$

ii) If all components are identical with  $P_1 = P_2 = \dots = P_n = P$  then reliability of  $n$  component parallel system is

- A)  $P^n$     B)  $(1 - P)^n$   
C)  $1 - (1 - P)^n$                               D)  $1 - (1 - P^n)$

iii) When a lot is accepted on the basis of second sample in double sampling plan the total inspection is

- A)  $n_1$                       B)  $n_2$                       C)  $n_1 + n_2$                       D)  $N$

iv) The path set of the three component series system is

- A)  $\{1, 2, 3\}$                       B)  $\{2, 3\}$                       C)  $\{1, 3\}$                       D)  $\{1, 2\}$

b) In each of the following, state whether the given statement is true or false.

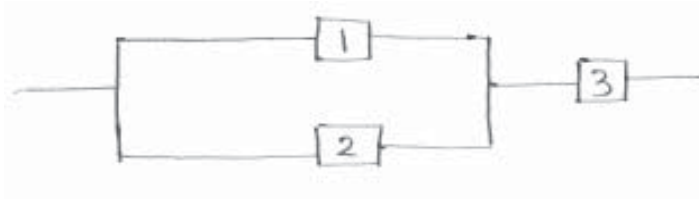
**(1 each)**

- i) AOQ of single sampling plan and double sampling plan is always same.
- ii) A coherent system is bounded below by the performance of a parallel system.

P.T.O.

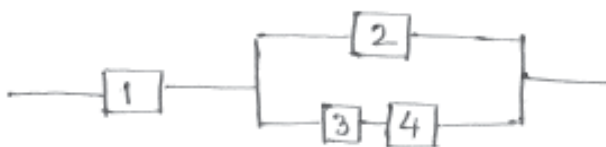


- c) Define the following terms : (1 each)
- i) Average Sample Number (ASN)
  - ii) DFRA distribution.
- d) i) State the rule for shifting to tightened inspection from normal inspection. 1
- ii) Obtain path vectors for the following reliability block diagram. 1



2. Attempt **any two** of the following :

- a) Derive the expression for ATI in case of double sampling plan. 5
- b) i) For a single sampling plan with  $N = 10000$ ,  $n = 100$ ,  $c = 3$ , obtain AOQ if lot quality is  $P = 0.03$ . 3
- ii) Explain the method of obtaining AOQL graphically. 2
- c) Obtain structure function and draw fault tree diagram of the following reliability block diagram. 5



3. Attempt **any two** of the following : (5 each)

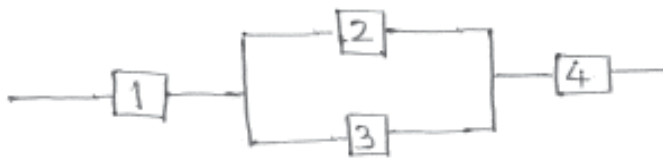
- a) Define 2 out of 3:G system and obtain reliability function for it if reliability of each component is  $P$ .
- b) Explain the working plan of double sampling plan with  $N = 2000$ ,  $n_1 = 15$ ,  $n_2 = 10$ ,  $C_1 = 0$ ,  $C_2 = 1$ . Also obtain probability of accepting a lot of quality  $p = 0.02$ .
- c) Show that life time of series system of independent components with independent IFR life time is IFR.



4. Attempt **any one** of the following :

a) i) Define survival function. Obtain the survival function and hazard rate of a life time (T) which follows exponential distribution.

ii) Obtain minimal path vector and minimal cut vector for the following reliability block diagram. **(5+5)**



b) i) Define ‘consumer’s risk’. Explain its use in determination of a single sampling plan.

ii) Discuss the role of Statistical techniques in ISO 9001 : 2000. **(6+4)**

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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**GEOGRAPHY (Paper – I)**  
**Gg.341 : Principles and Techniques of Watershed Management**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- N.B.:** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*  
3) *Diagrams and maps must be drawn wherever necessary.*  
4) *Use of map stencils is allowed.*

1. Answer the following questions in **one** or **two** sentences : **10**
- a) Define watershed planning.
  - b) What is meant by resource appraisal ?
  - c) What is water harvesting ?
  - d) List the methods of soil conservation.
  - e) Define the term rain-fed catchments.
  - f) What is resource mapping ?
  - g) Define capacity building.
  - h) What is meant by cost sharing ?
  - i) List two reasons for the need for Second Green Revolution.
  - j) Define livelihood security.
2. Write short answers (**any two**) : **10**
- a) Comment on the importance of watershed planning in environment conservation.
  - b) Discuss the various methods used for soil conservation.
  - c) Comment on any two traditional methods of water conservation in Rajasthan.

P.T.O.



3. Write short notes (**any two**) : **10**

- a) Resource mapping in watershed planning
- b) Equity and gender sensitization
- c) Production oriented sustainability.

4. Give an account of the surveys carried out for resource appraisal. **10**

OR

Give an account of rural and integrated watershed development plan.

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**T.Y.B.Sc. (Semester – IV) Examination, 2012**  
**GEOGRAPHY (Paper – II)**  
**Gg 342 : Geography of Travel and Tourism**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- N.B. :** 1) *All questions are **compulsory**.*  
2) *Figures to the **right** indicate **full** marks.*  
3) *Diagrams and Maps must be drawn **wherever** necessary.*  
4) *Use of Maps stencils is **allowed**.*

1. Answer the following questions in **one** or **two** sentences : **(10)**
- a) What are youth hostels ?
  - b) What is agro tourism ?
  - c) Name two types of land adventure tourism.
  - d) State one impact of tourism on wild life.
  - e) State one impact of tourism on traditional arts.
  - f) In which state is Hampi located ?
  - g) Name two historical places in India.
  - h) What are foreign exchange earnings in tourism ?
  - i) What is direct expenditure in the tourism sector ?
  - j) Where are house boats found in India.
2. Write short answers (**any two**) : **(10)**
- a) Importance of caravan tourism.
  - b) Adventure tourism.
  - c) Importance of air transport in tourism in India.

P.T.O.



3. Write short notes (**any two**) : **(10)**
- a) Geo tourism.
  - b) Impact of tourism on vegetation.
  - c) Ajanta and Ellora.
4. Discuss the development of beach resorts in India.

OR

Discuss the concept of sustainable tourism development and its significance in India. **(10)**

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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**GEOGRAPHY (Paper – III)**  
**Gg – 343 : Fundamentals of Geoinformatics**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- N.B :** 1) *All questions are **compulsory**.*  
2) *Figures to the **right** indicate **full** marks.*  
3) *Diagrams and maps must be drawn **wherever** necessary.*  
4) *Use of map stencils is **allowed**.*

1. Answer the following questions in **one** or **two** sentences : **10**
- a) What do you mean by Digital Image Processing ?
  - b) What is Local operation ?
  - c) What is radiometric correction ?
  - d) Define 'contrast'.
  - e) List the factors which are responsible for geometric distortion.
  - f) What is low pass filtering ?
  - g) What is supervised classification ?
  - h) What is pixel ?
  - i) What is non-spatial query ?
  - j) Mention the type of reports in GIS.
2. Write short answers (**any two**) : **10**
- a) Explain RGB format.
  - b) Explain atmospheric corrections.
  - c) Explain spatial feature manipulation.

P.T.O.



3. Write short notes (**any two**) : **10**
- a) Buffering
  - b) Digital display
  - c) Supervised classification.
4. What is overlay analysis ? Giving examples and explain the various overlay operations used in GIS. **10**

OR

What is image enhancement ? Explain the contrast enhancement with suitable examples.

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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**GEOGRAPHY (Paper – IV)**  
**Gg 344 : India – A Geographical Study (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- N.B. :** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*  
3) *Diagrams and maps must be drawn wherever necessary.*  
4) *Use of Maps Stencils is allowed.*

1. Answer the following questions in **one** or **two** sentences : **10**
- a) Name two metallic minerals.
  - b) What is magnetite ?
  - c) State one important use of Bauxite.
  - d) Name two areas where lignite is found in India.
  - e) Name two oil fields in North East India.
  - f) What is Blue revolution ?
  - g) Name two factors affecting the location of cotton textile industry.
  - h) State one salient feature of air transport.
  - i) Name any two areas with very high population density in India.
  - j) Name two social factors affecting migration.
2. Write short answers (**any two**) : **10**
- a) Nuclear power in India.
  - b) Factors influencing the development of hydro electric power in peninsular India.
  - c) Impact of the green revolution on agriculture.

P.T.O.



3. Write short notes (**any two**) : **10**

- a) Importance of rural urban migration in India.
- b) Advantages of pipelines.
- c) Distribution of iron ore in India.

4. State the importance of infrastructural factors on Agricultural Development in India. **10**

OR

Discuss the composition of population in India.

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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**GEOGRAPHY (Paper – V)**  
**Gg.345 : Geography of Soils**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- N.B. :** 1) **All questions are compulsory.**  
2) **Figures to the right indicate full marks.**  
3) **Diagrams and maps must be drawn wherever necessary.**  
4) **Use of map stencils is allowed.**

1. Answer the following questions in **one** or **two** sentences : **10**

- a) Mention various factors of soil formation.
- b) Which type of climatic condition is required for laterization ?
- c) Define the 'process of translocation'.
- d) Define 'Podzolization'.
- e) What do you understand by secondary salinization ?
- f) Write any two characteristics of podzol soil.
- g) What do you understand by rill erosion ?
- h) What do you understand by sheet erosion ?
- i) What is soil degradation ?
- j) What do you understand by deforestation ?

2. Write short answers (**any two**) : **10**

- a) What are the types of humus ?
- b) Explain how relief is a determinant factor in the process of soil formation.
- c) What is role of living organisms in the process of soil formation ?

P.T.O.



3. Write short notes (**any two**) : **10**

a) Classification of tropical soils

b) Clay minerals

c) Organic matter.

4. Explain various biochemical compounds present in the soil. **10**

OR

Discuss various methods of soil conservation in India.

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**T.Y. B.Sc.(Semester – IV) Examination, 2012**  
**GEOGRAPHY**  
**Gg 346 : Fundamentals of Geoinformatics (Paper – VI)**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- N.B. :** 1) *All questions are **compulsory**.*  
2) *Figures to the **right** indicate **full** marks.*  
3) *Diagrams and maps must be drawn **wherever** necessary.*  
4) ***Use** of map stencils is **allowed**.*

1. Answer the following questions in **one** or **two** sentences : **10**
- a) What is 'platform' ?
  - b) What is synchronous ?
  - c) What do you mean by Band ?
  - d) Define the term 'Spatial resolution'.
  - e) What is MSS ?
  - f) Mention the list of IRS satellite series.
  - g) Pushbroom scanner.
  - h) What is Radar ?
  - i) What is DIP ?
  - j) Define the term 'Orbit'.
2. Write short answers (**any two**) : **10**
- a) What is Multispectral image ?
  - b) What do you mean by ERTS satellite ?
  - c) State the major characteristics of IKONOS satellite.

P.T.O.



3. Write short notes (**any two**) : **10**
- a) Resolution
  - b) Thermal infrared images
  - c) SPOT.

4. Give an account of IRS series satellites. **10**

OR

Give an account on Applications of aerial photographs and Satellite images in environmental studies.

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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**MICROBIOLOGY (Paper – II)**  
**MB – 342 : Genetics and Molecular Biology – II**  
**(2008 Pattern) (New)**

Time : 2 Hours

Max. Marks : 40

- N.B. :** 1) *All questions are compulsory.*  
2) *All questions carry equal marks.*  
3) *Draw neat, labelled diagram wherever necessary.*

1. Attempt the following : 10

a) Fill in the blanks :

i) Genetic transfer between bacterial cells which require cell to cell contact is \_\_\_\_\_,

ii)  $\begin{matrix} G \downarrow A A T T C \\ C T T A A \uparrow G \end{matrix}$  is the restriction site for \_\_\_\_\_ restriction enzyme.

iii)  $\begin{matrix} G G \downarrow C C \\ C C \uparrow G G \end{matrix}$  generates \_\_\_\_\_ ends.

iv) \_\_\_\_\_ polymerase is used for PCR technique.

v) **Cis-trans** test was designed by \_\_\_\_\_.

b) Match the following :

**A**

- i) rec A protein
- ii) Griffith's experiment
- iii) Hfr strain
- iv) F factor
- v) Tra operon

**B**

- a) Integrated F plasmid
- b) Contains small part of donor DNA
- c) Homologous recombination
- d) Self transfer of plasmid
- e) Transformation

P.T.O.



2. Draw neat labeled diagrams of **any two** of the following : **(10)**
- a) **Homologous** recombination
  - b) **PCR** technique.
  - c) **Breakage and copying model** of recombination.
3. Write short notes on **any two** of the following : **(10)**
- a) Factors affecting transformation.
  - b) **R** plasmids in drug resistance.
  - c) **Southern Blot** technique.
4. Attempt **any one** of the following : **(10)**
- a) Describe in detail the formation of **Recombinants** by **Generalized transduction**.
  - b) Describe in detail various steps of **Genetic Engineering** to generate **recombinants**.



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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**MICROBIOLOGY (Paper – IV)**  
**MB-344 : Immunology – II**  
**(2008 Pattern) (New)**

Time : 2 Hours

Max. Marks : 40

- N.B. :** 1) *All questions are compulsory.*  
2) *All questions carry equal marks.*  
3) *Draw neat labeled diagrams wherever necessary.*

1. Attempt the following : 10

a) Define

- i) MHC
- ii) Autograft
- iii) Vaccine

b) State **True** or **False** :

- i) MHC antigen typing protects graft rejection.
- ii) IgM antibody production is enhanced during secondary immune response.

c) Match the following :

**A**

- i) Mixed lymphocyte reaction
- ii) Cytotoxic T-Lymphocyte
- iii) Type IV allergy
- iv) Passive immunization
- v)  $T_C$ ,  $T_{DH}$  and NK cells

**B**

- a) Contact dermatitis
- b) Antisera
- c) CMI
- d) Hypersensitivity
- e) MHC antigen typing

P.T.O.



2. Attempt **any two** of the following : **10**
- a) Draw neat labeled diagram of Type III and Type IV hypersensitivity.
  - b) Describe the structure and function of MHC in man and mouse.
  - c) Explain in brief HDN.
3. Write short notes on **any two** of the following : **10**
- a) Significance of CMI
  - b) Types of Vaccines.
  - c) Tumour Necrosis Factors.
4. Attempt **any one** of the following : **10**
- a) Describe antigen processing and presentation by MHC class I.
  - b) Explain 'ABO and Rh' blood group antigen classification systems. Describe 'blood transfusion reactions'.

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Seat No.	
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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**MICROBIOLOGY (Paper – VI)**  
**MB – 346 : Soil and Agricultural Microbiology**  
**(2008 Pattern) (New)**

Time : 2 Hours

Max. Marks : 40

- N.B. :** 1) *All questions are compulsory.*  
2) *All questions carry equal marks.*  
3) *Draw neat, labeled diagram wherever necessary.*

1. Attempt the following : **10**
- a) Name any two Chlorinated insecticides.
  - b) Write any one disadvantage of Chemical fertilizers.
  - c) State **true** or **false**.
    - i) *Bornite* ore of Copper is fairly resistant to leaching by microorganisms.
    - ii) *Agrobacterium sp.* causes smut.
    - iii) Organic pesticides can serve as carbon source for the growth of microorganisms.
  - d) Give composition of *Biogas*.
  - e) Define :
    - i) Soil
    - ii) Nitrogen fixation.
  - f) Write symptoms of *Downy mildew*.
  - g) Write an example of Phosphate solubilizing bacterium.

P.T.O.



2. Attempt **any two** of the following : **10**
- a) Draw a neat labeled diagram of *Nitrogen* cycle.
  - b) Enlist raw materials used for *Biogas* production. Explain the biochemical mechanisms of methane production.
  - c) Describe the formation of humus.
3. Write short notes on **any two** of the following : **10**
- a) Composition of soil.
  - b) Chemical control of plant diseases.
  - c) Bioinoculants.
4. Attempt **any one** of the following : **10**
- a) Describe *Smut* disease with respect to causative agent, plant affected and control.
  - b) Explain biochemistry of non-symbiotic nitrogen fixation.

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Seat No.	
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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**ELECTRONIC SCIENCE (Paper – I)**  
**EL – 341 : Advanced Communication Systems**  
**(2008 Pattern) (New)**

Time : 2 Hours

Max. Marks : 40

- N.B. :** 1) *All questions are compulsory.*  
2) *Neat diagrams must be drawn wherever necessary.*  
3) *Figures to the right indicate full marks.*

1. Attempt **all** of the following :

- a) What is the drawback of aliasing error ? 1
- b) State any two non-linear devices used in balanced modulator. 1
- c) Write any two parameters of Rf power amplifier. 1
- d) What is resonant antenna ? 1
- e) “Granular noise increases with increase in the step size”. Comment. 2
- f) Write any four advantages of PCM techniques. 2
- g) “It is possible to generate phase modulated signal using frequency modulator”.  
Comment. 2
- h) Calculate the directivity for antenna having power gain  $10^3$  and efficiency 90 %. 2

2. Attempt **any two** of the following :

- a) Explain QASK modulation technique using geometric representation. 4
- b) Write the Maxwell’s equations in integral form and give their physical significance. 4
- c) Explain construction and working of Reflex klystron oscillator. 4

P.T.O.



3. Attempt **any two** of the following :
- a) What is the working principle of radio transmitter ? Explain its working with the help of block diagram. 4
  - b) Explain the working of Delta Modulator with suitable block diagram. 4
  - c) Explain phase shift method of side band suppression. 4
4. Attempt **any two** of the following :
- a) Explain the working of Balanced modulator using FETs. Derive the expression for its output voltage. 6
  - b) What is Doppler effect ? Explain working of simple continuous wave Doppler radar. 6
  - c) Write short notes on :
    - i) Far field and near field of antenna
    - ii) Folded half wave dipole antenna. 6

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Seat No.	
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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**ELECTRONICS SCIENCE (Paper – II)**  
**EL-342 : Embedded Systems**  
**(New Course) (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

***N.B. :*** 1) ***All questions are compulsory.***  
2) ***Figures to right indicate full marks.***

1. Attempt **all** the following :

- a) Write the address space assigned for 'sfr'. 1
- b) State which data type you would use for indicating age of Humanbeing. 1
- c) Which timer of the 8051 micro controller is used to get the baud rate ? 1
- d) State the address space of 4KB external ROM interfaced to 8051 microcontroller. 1
- e) Find the content of P<sup>1</sup> after execution of the following : 2  
 $P^2 = 0 \times 00 ;$   
 $P^1 = P^2 \& 0 \times FF;$   
 $P^1 = \sim P^1;$
- f) State the advantages of using 'C' for 8051 programming. 2
- g) State the different steps for finding TH and TL registers value in the delay calculations. 2
- h) What are line drivers such as MAX 232 used for ? 2

P.T.O.



2. Attempt **any two** of the following :
- a) Write an 8051 C program to toggle bit  $P_0$  of port  $P_1$  20,000 times. 4
  - b) Write an 8051 C program to generate the square wave on port  $P_1$ . Use timer 0 in mode 1 to generate delay. 4
  - c) Write C program for 8051 to transfer message 'HELLO' serially at 2400 baud, 8 bit data, 1-stop bit continuously. 4
3. Attempt **any two** of the following :
- a) Explain with suitable example bitwise logical operators in 8051 C programming. 4
  - b) What is use of RS-485 ? State its features. 4
  - c) Draw the block diagram of 8051 based target board. List the different components used on it. 4
4. Attempt **any two** of the following :
- a) State the two ways to create a time delay in 8051 microcontroller C. Explain three factors that can affect the delay size. 6
  - b) With proper block diagram and flow chart, explain Traffic light control system. 6
  - c) Discuss case study of water level controller. 6

OR

4. Attempt **all** the following :
- a) Write a program to get an 8 bit binary number from P1, convert it to ASCII and store the result if the input is packed BCD OF 00 - 0 × 99. Assume P1 has 1000 1001 binary as input. 4
  - b) Interface 2K × 8 bit external RAM to 8051. 4
  - c) Interface LCD to 8051 microcontroller. State its advantage over LED. 4



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**T.Y. B.Sc. (Semester – IV) Examination, 2012  
ELECTRONICS SCIENCE (Paper – IV)  
EL-344 : Electronic Materials and Devices  
(2008 Pattern) (New Course)**

Time : 2 Hours

Max. Marks : 40

- N.B. :** 1) *All questions are compulsory.*  
2) *Neat diagrams must be drawn wherever necessary.*  
3) *Figures to the right indicate full marks.*  
4) *Log table/calculator is allowed.*

1. Attempt **all** of the following :

- |  |   |
|--|---|
| a) State different types of contact materials.         | 1 |
| b) What is super conductor ?                           | 1 |
| c) Define Curie temperature.                           | 1 |
| d) What is phonon ?                                    | 1 |
| e) What do you mean by thermal breakdown ?             | 2 |
| f) Write the example of donor and acceptor impurities. | 2 |
| g) Define co-ordination number.                        | 2 |
| h) What is crystal lattice ?                           | 2 |

2. Attempt **any two** of the following :

- |   |   |
|---|---|
| a) State classification and properties of plastics.             | 4 |
| b) Explain Ionic polarization.                                  | 4 |
| c) Explain the phenomenon of doping in p-type of semiconductor. | 4 |

P.T.O.



3. Attempt **any two** of the following :

- a) Explain dielectric breakdown and partial discharge in gases. 4
- b) Explain direct bandgap and indirect bandgap of semiconductor. 4
- c) Describe the construction of resonant tunneling diode with proper diagram. 4

4. Attempt **any two** of the following :

- a) What is soft magnetic material and hard magnetic material ? What is the difference in their properties ? What are their applications ? 6
- b) What is unit cell ? How it is used to explain lattice structure ? Give example. 6
- c) Explain with suitable diagram the working principle of photodiode. 6

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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**ELECTRONICS SCIENCE (Paper – V)**  
**EL-345 : Mathematical Methods and Analysis using MATLAB**  
**(New Course) (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- N.B :** 1) *All questions are compulsory.*  
2) *Neat diagrams must be drawn wherever necessary.*  
3) *Figures to the right indicate full marks.*  
4) *Logtable/calculator is allowed.*

1. Answer **all** of the following :

- a) What is clc command in MATLAB ? **1**
- b) Define continuous time signal. **1**
- c) 'Fourier transform is nothing but Fourier integral', comment. **1**
- d) What do you mean by curve fitting ? **1**
- e) State the main difference between script file and function file in MATLAB. **2**
- f) Write a MATLAB program to evaluate Laplace transform of  $f(t) = 5e^{-2t}$ . **2**
- g) How the multiple plots are plotted on the same page using MATLAB ? Give one example. **2**
- h) Explain  $f_{open}$  and  $f_{read}$  file commands in MATLAB. **2**

P.T.O.



2. Answer **any two** of the following :

- a) Plot in red color  $y = \sin x$  taking 180 linearly spaced points in the interval  $0 \leq x \leq \pi$ . Label the axes, and put “sinewave function” name to the graph. **4**
- b) Find inverse Laplace transform of  $F(s) = \frac{s+1}{s^2+4}$ . Write MATLAB command to evaluate it. **4**
- c) Show that Fourier series expansion of an even periodic function contains only cosine terms and a constant. **4**

3. Answer **any two** of the following :

- a) Explain curve fitting with polynomial function in MATLAB using polyfit, polyval. Give one example. **4**
- b) If  $R = 10$  ohm and the current through it is increased from 0 to 10 Amp. with increment of 2 Amp., write a MATLAB program to generate a table of current, voltage and power dissipation. Plot graph of current versus voltage. **4**
- c) Find Laplace transform of  $f'(t)$ . **4**

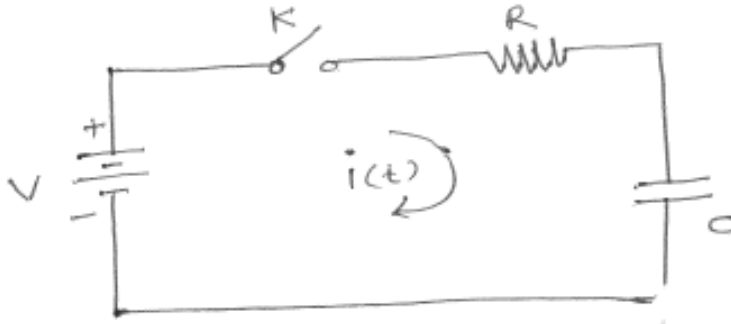
4. Answer **any two** of the following :

- a) Write 3D equations in Cartesian coordinate system :
- i) Laplace equation                      ii) Poisson equation.
- Solve Laplace equation by variable separation method. **6**
- b) Explain mesh and surface 3D graphical facility provided by MATLAB. Elaborate with creation of grid on the graph. **6**



- c) In the following RC circuit if K is closed at time  $t = 0$ ; determine the current using Laplace transform after switch K is closed (Use initial condition  $q(0^+) = 0$ ).

6



OR

4. Answer **all** of the following :

a) Evaluate Fourier coefficient  $a_0$  for triangular wave which is represented by

$$f(x) = x, \quad \text{if } 0 < x < \pi$$

$$f(x) = -x, \quad \text{if } -\pi < x < 0$$

4

b) Explain the format of following MATLAB commands :

4

i) fplot

ii) xlabel

iii) legend

iv) axis

c) State and prove transforms of linear combination property for Laplace transform. Mention its use in network analysis.

4



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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**DEFENCE AND STRATEGIC STUDIES (Paper – I)**  
**DS-341: Management of Military Technology in India**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

***N.B. :*** i) ***All questions are compulsory.***  
ii) ***Figures to the right indicate marks.***

1. Answer in **2 to 4** sentences **each** : **16**
- 1) Define 'Military'.
  - 2) Define 'Technology'.
  - 3) Name all the premier technical Institute in India.
  - 4) What is Technology acquisition ?
  - 5) What is First Grade Technology ?
  - 6) Define 'Revolution in Military Affairs' (RMA).
  - 7) What is Dual use technologies ?
  - 8) Define the term 'strategic management'.
2. Answer in **8 to 10** sentences (**any two**) : **8**
- 1) Give a background of Science and Technical Education in India.
  - 2) Explain the status of R & D in India.
  - 3) Explain transfer of Technology and absorption.

P.T.O.





3. Write short notes on **(any two)** : **8**

- 1) Technology Forecasting
- 2) Weapon Development
- 3) Technology development and acquisition.

4. Answer in **16 to 20** sentences **(any one)** : **8**

- 1) Do you think that India is a rising global power ? Give your opinion.
- 2) Explain Indo-Russian Military Technology collaboration.

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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**DEFENCE AND STRATEGIC STUDIES (Paper – II)**  
**DS-342 : Economic Aspects of War**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

***N.B. : 1) All questions are compulsory.***  
***2) Each questions carry equal marks.***

1. Answer in **two to four** sentences **each** : **16**
  - 1) How you would like to define War time economy ?
  - 2) What do you mean by Economic Structure ?
  - 3) State the meaning of Economic cost of war.
  - 4) What do you mean by war finance ?
  - 5) Write the meaning of Threat perception.
  - 6) What are the sources of war finance ?
  - 7) How you would like to define economic warfare ?
  - 8) What do you mean perspective in defence planning ?
2. Answer in **8 to 10** sentences **each (any two)** : **8**
  - 1) Explain demerits war time economy.
  - 2) Discuss merits of peace time economy.
  - 3) Explain parliamentary control over defence budgeting.
3. Write short notes on **(any two)** : **8**
  - a) Structure of India's defence budget.
  - b) Economic warfare.
  - c) Effects of war on society.
4. Answer in **16 to 20** sentences **(any one)** : **8**
  - 1) Establish relationship between Defence and Development.
  - 2) Analyses India's defence expenditure from 1980's to present day.



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**T.Y. B.Sc. (Semester – IV) Examination, 2012  
DEFENCE AND STRATEGIC STUDIES (Paper – III)  
DS-343 : Disaster Management (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

***N.B. :*** 1) ***All questions are compulsory.***  
2) ***Each questions carry equal marks.***

1. Answer in **two to four** sentences **each**. **16**
- 1) How you would like to define Tsunami ?
  - 2) What do you mean by cooperation by Local Bodies in disaster management ?
  - 3) State the meaning of planning and enforcement.
  - 4) What do you mean by Relief work ?
  - 5) Write the meaning of remedial measures in disaster management.
  - 6) What do you mean by Early warning system in disaster management ?
  - 7) What are the types of Disaster ?
  - 8) What do you mean by process of settlement ?
2. Answer in **8 to 10** sentences each (**any two**) : **8**
- 1) Explain organizational set up of Disaster management.
  - 2) Discuss role of the Local bodies in Disaster Management.
  - 3) Explain need for boosting morale of community in Disaster Management.

P.T.O.



3. Write short note on (**any two**) : **8**

- 1) India's National policy for Disaster Management.
- 2) Socio-Economic impact of Disaster Relief operations.
- 3) Disaster Management and Sustainable Development.

4. Answer in **16 to 20** sentences (**any one**) : **8**

- 1) Establish relationship between National Security and Disaster.
- 2) Write a note on psychological and Sociological consequences of Disaster.

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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**DEFENCE AND STRATEGIC STUDIES (Paper – V)**  
**DS-345 : Information Technology and National Security (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

***N.B. :*** 1) ***All questions are compulsory.***  
2) ***Each questions carry equal marks.***

1. Answer in **two to four** sentences **each** : **16**
  - 1) How you would like to define Information Technology ?
  - 2) What do you mean by Night Vision ?
  - 3) State the meaning of Surveillance.
  - 4) What do you mean by War Gaming ?
  - 5) Write the meaning of CAD.
  - 6) What is Operational Research ?
  - 7) How you would like to define simulation ?
  - 8) What do you mean Computer Management ?
2. Answer in **8 to 10** sentences **each (any two)** : **8**
  - 1) Explain Generations of Computer.
  - 2) Discuss Battlefield Information System.
  - 3) Explain importance of weather forecasting in Defence Management
3. Write short note on **(any two)** : **8**
  - a) Night Vision
  - b) R \$ D simulator
  - c) Target Acquisition System
4. Answer in **16 to 20** sentences **(any one)** : **8**
  - 1) Establish relationship between Information Technology and National Security.
  - 2) Analyses “Use of computer in Defence Management”.



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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**DEFENCE AND STRATEGIC STUDIES – VI**  
**DS – 346(A) : Indian Military System – II (Optional) (Elective – VI)**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

**N.B. :** 1) **All questions are compulsory.**  
2) **Figures to the right indicate full marks.**

1. Answer in **2** or **4** sentences : **16**
- 1) When and between whom the first battle of Panipat was fought ?
  - 2) State any two names of India's Southern empire.
  - 3) State the duration of Mughal period.
  - 4) What do you understand by Mansabdar ?
  - 5) Write the chief weapons of Mughals.
  - 6) State any two names of distinguish rulers of Sultan.
  - 7) What was the aim of battle of Haldighat for Rajputs ?
  - 8) State the weapons of Sultan period.
2. Answer in **8** to **10** sentences (**any two**) : **8**
- 1) Write in brief the military reforms introduced by Allauddin Khilji.
  - 2) Explain the significance of first battle of Panipat.
  - 3) Write in brief art of warfare of Mughals.
3. Write short notes on (**any two**) : **8**
- 1) Significance of third battle of Panipat.
  - 2) Sultan's Military System.
  - 3) Babar as a founder of Mughal empire.
4. Answer in **16** to **20** sentences (**any one**) : **8**
- 1) Explain the causes of defeat of Maratha at the third battle of Panipat.
  - 2) Analyse the causes of downfall of Sultan.

P.T.O.



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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**DEFENCE AND STRATEGIC STUDIES – VI**  
**DS – 346 (B) : Maratha Military System – II (Optional) (Elective – VI)**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

**N.B. :** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*

1. Answer in **2** or **4** sentences : **16**
- 1) Who was Shivaji ?
  - 2) What do you mean Guerrilla Tactics ?
  - 3) What was the backbone of hostility between Anglo and Maratha ?
  - 4) When and between whom the battle of Bhopal was fought ?
  - 5) Which tactics was adopted by Santaji and Dhanaji ?
  - 6) When and between whom the third battle of Panipat was fought ?
  - 7) State the meaning of Peshwa.
  - 8) What do you know about Tarabai ?
2. Answer in **8** to **10** sentences (**any two**) : **8**
- 1) Write in brief Shivaji as a military leader.
  - 2) Explain in brief significance of third battle of Panipat.
  - 3) Write few lines on Kanhoji Angre.
3. Write short notes on (**any two**) : **8**
- 1) Rajaram
  - 2) Achievements of Sambhaji
  - 3) First Anglo-Maratha war.
4. Answer in **18** to **20** sentences (**any one**) : **8**
- 1) Analyse the causes of downfall of Maratha.
  - 2) Assess the first “Bajirao Peshwa as a Military General”.
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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**DEFENCE AND STRATEGIC STUDIES – VI**  
**DS – 346 (C) : Indian Wars since Independence – II (Optional) (Elective – VI)**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

**N.B. :** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*

1. Answer in **2** or **4** sentences : **16**
  - 1) What do you mean by “Mukti Bahini” ?
  - 2) Which front was decisive front during Indo-Pak war at 1971 ?
  - 3) Where the Kargil is located ?
  - 4) What do you mean by I.P.K.F. ?
  - 5) In which year “Simla Agreement” was signed ?
  - 6) Write the duration of Kargil war.
  - 7) On which date and year the ceasefire took place during Indo-Pak war of 1971 ?
  - 8) What do you mean by L.T.T.E. ?
2. Answer in **8** to **10** sentences (**any two**) : **8**
  - 1) Write few lines on “Simla Agreement” signed between India and Pakistan.
  - 2) Explain the objectives of IPKF during military operation in Sri Lanka.
  - 3) How the Kargil war of 1999 came to an end ?
3. Write short notes on (**any two**) : **8**
  - 1) Result of 1971 war
  - 2) Causes of India’s action in Maldiva
  - 3) End of Kargil war : Indian Approach.
4. Answer in **16** to **20** sentences (**any one**) : **8**
  - 1) What were the implications of Kargil war of 1999 at domestic, regional and global level ?
  - 2) Explain in detail the background and causes of Indo-Pak war of 1971.







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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**DEFENCE AND STRATEGIC STUDIES – VII**  
**DS-347 (A) : Military Psychology (Optional) (Elective – VII)**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

***N.B. :*** i) ***All questions are compulsory.***  
ii) ***Figures to the right indicate marks.***

1. Answer in **2 to 4** sentences each : **16**
  - 1) What is 'War Neurosis' ?
  - 2) Define 'Authoritarian leadership'.
  - 3) Differentiate between 'Morale and Moral'.
  - 4) Establish relation between 'Stimulus and Motivation'.
  - 5) Define 'war'.
  - 6) Define 'Soldiering'.
  - 7) What is 'War Fatigue' ?
  - 8) What is meant by soldier's honour ?
  
2. Answer in **8 to 10** sentences (**any two**) : **8**
  - 1) Discuss the uses of psychology in war.
  - 2) Write the role of propaganda in Psychological warfare.
  - 3) Explain the psychological view of war.
  
3. Write short notes on (**any two**) : **8**
  - 1) Military Psychology
  - 2) Motivation
  - 3) Leadership
  
4. Answer in **16 to 20** sentences (**any one**) : **8**
  - 1) Explain mental toughening against war neurosis.
  - 2) What is the role of psychology in making the armed forces as an institution ?

P.T.O.



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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**DEFENCE AND STRATEGIC STUDIES – VII**  
**DS-347 (B) : Defence Journalism and National Security (Optional)**  
**(Elective – VII) (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

***N.B. :*** i) ***All questions are compulsory.***  
ii) ***Figures to the right indicate marks.***

1. Answer in **2 to 4** sentences each : **16**
    - 1) What is meant by 'Defence'.
    - 2) Define 'National Security'.
    - 3) Define 'Journalism'.
    - 4) Why ethics are necessary in Journalism ?
    - 5) Define 'Naval Power'.
    - 6) What is AWACS ?
    - 7) Write the role of Air Force.
    - 8) What is Insurgency ?
  
  2. Answer in **8 to 10** sentences (**any two**) : **8**
    - 1) Write the significance of Media to National security.
    - 2) Make a reporting of Naval power exercise.
    - 3) Make a reporting of Republic day Parade.
  
  3. Write short notes on (**any two**) : **8**
    - 1) Indo-Pak relations
    - 2) Internal security
    - 3) Importance of soldiering in society.
  
  4. Answer in **16 to 20** sentences (**any one**) : **8**
    - 1) Make a reporting of NDA passing out Parade.
    - 2) Describe the qualifications and required knowledge of Defence Reporter.
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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**DEFENCE AND STRATEGIC STUDIES – VII**  
**DS-347 (C) : Defence Preparedness of India – II (Optional)**  
**(Elective – VII) (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

**N.B. :** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*

1. Answer in **2** or **4** sentences each : **16**
  - 1) Where the Army HQ is located ?
  - 2) Who is the Chief of Army staff ?
  - 3) What do you mean by war potential ?
  - 4) State any two names of Indian Missiles.
  - 5) Where the HQ of Indian Air Force is located ?
  - 6) State the name of India's Defence Minister.
  - 7) What do you mean by process of Modernisation ?
  - 8) How many commands Indian Army have ?
2. Answer in **8** to **10** sentences (**any two**) : **8**
  - 1) Write a few lines on weapons of Indian Army.
  - 2) Explain the commands of Indian Navy.
  - 3) Write in brief achievements of Airforce in relation to process of Modernisation.
3. Write short notes on (**any two**) : **8**
  - 1) Present status of weapon system of Indian Airforce.
  - 2) Process of modernisation of Indian Navy.
  - 3) Commands of Indian Army.
4. Answer in **16** to **20** sentences (**any one**) : **8**
  - 1) Compare the war potential of India and China in the present context.
  - 2) Explain the India's quest for modernisation of Airforce.



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**T.Y. B.Sc. (Sem. – IV) Examination, 2012**  
**DEFENCE AND STRATEGIC STUDIES – VIII**  
**DS - 348 (A) : Refugees Studies (2008 Pattern)**  
**(Elective – VIII)**

Time : 2 Hours

Max. Marks : 40

**N.B.:** i) *All questions are compulsory.*  
ii) *Figures to the **right** indicate marks.*

1. Answer in **2 to 4** sentences each. **16**
  - 1) Define 'Refugee'.
  - 2) What is 'Convention' ?
  - 3) Define 'Migration'.
  - 4) Elaborate UNCHR.
  - 5) Introduce 'South Asia'.
  - 6) What is Border ?
  - 7) Define 'Protocol'.
  - 8) What is International Law ?
2. Answer in **8 to 10** sentences (**any two**): **8**
  - 1) Explain 1951 convention on Refugee.
  - 2) Explain 1967 Protocol regarding Refugee.
  - 3) How a person becomes Stateless ?
3. Write short notes on (**any two**): **8**
  - 1) Refugee law.
  - 2) World Opinion on Refugee.
  - 3) United Nations and Refugee.
4. Answer in **16 to 20** sentences (**any one**) **8**
  - 1) Discuss the rights and duties of Refugees.
  - 2) What are the Refugee problems in South Asia ?

P.T.O.



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**T.Y. B.Sc. (Sem. – IV) Examination, 2012**  
**DEFENCE AND STRATEGIC STUDIES – VIII**  
**DS - 348 (B) : Study of United Nations (Optional)**  
**(Elective – VIII) (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

**N.B.:** i) *All questions are compulsory.*  
ii) *Figures to the **right** indicate marks.*

1. Answer in **2** or **4** sentences. **16**
  - 1) State the meaning of ILO.
  - 2) What do you mean by Nuclear Disarmament ?
  - 3) Write the name of any two specialised agencies of UN.
  - 4) What do you mean by Trusteeship Council ?
  - 5) Which agency of UN deals with International conflicts ?
  - 6) What do you understand by WHO ?
  - 7) State the meaning of International Organization.
  - 8) At present how many countries are the members of UN ?
  
2. Answer in **8** to **10** sentences (**any two**): **8**
  - 1) Explain in brief the concept of Disarmament.
  - 2) Write in short the meaning of International Conflict.
  - 3) Explain in brief 'UN and Human Rights'.
  
3. Write short notes on (**any two**): **8**
  - 1) Socio-Economic Council.
  - 2) Concept of Human Rights.
  - 3) IMF.
  
4. Answer in **18** to **20** sentences (**any one**): **8**
  - 1) Describe the role of UN for preventing the World War – III.
  - 2) Highlight on hindrances in the working of UN with examples.



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**T.Y. B.Sc. (Sem. – IV) Examination, 2012**  
**DEFENCE AND STRATEGIC STUDIES – VIII**  
**DS - 348 (C) : Laws of War and Peace (Elective – VIII)**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

**N.B.:** i) *All questions are compulsory.*  
ii) *Figures to the right indicate marks.*

1. Answer in **2 to 4** sentences **each**. **16**
  - 1) Define War.
  - 2) What is 'State' ?
  - 3) Define 'Peace'.
  - 4) Define 'Defence'.
  - 5) What is 'Collective Security' ?
  - 6) Define Disarmament.
  - 7) What is Air Force ?
  - 8) What is Maritime power ?
  
2. Answer in **8 to 10** sentences (**any two**): **8**
  - 1) What is War Crimes ?
  - 2) Explain the right of Self-Defence.
  - 3) Explain about the type of States.
  
3. Write short notes on (**any two**): **8**
  - 1) Collective Security.
  - 2) Disarmament.
  - 3) Intervention.
  
4. Answer in **16 to 20** sentences (**any one**): **8**
  - 1) Explain the laws of land warfare.
  - 2) Explain the laws of Air Warfare.



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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**DEFENCE AND STRATEGIC STUDIES (Paper – IX)**  
**DS-349 (A) : Management of Defence Production and Logistics in India**  
**(Elective – IX)**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

**N.B. :** 1) Figures to the **right** indicate **full** marks.  
2) **All** questions are **compulsory**.

1. Answer in **2** or **4** sentences : **16**
  - 1) What do you mean by defence production ?
  - 2) Define 'Logistics'.
  - 3) Write the long form of DRDO.
  - 4) What do you mean by O.F. ?
  - 5) State any two projects of private sector.
  - 6) Write the meaning of DPSU.
  - 7) What do you mean by mobilisation ?
  - 8) What do you understand by HAL ?
2. Answer in **8** to **10** sentences (**any two**) : **8**
  - 1) Write in brief "just in time concept".
  - 2) Explain in brief the functions of department of defence production.
  - 3) Write in short the problem of Foreign collaboration.
3. Write short notes on (**any two**) : **8**
  - 1) MDL
  - 2) GSL
  - 3) Supply chain management.
4. Answer in **16** to **20** sentences (**any one**) : **8**
  - 1) Describe the role of DRDO in defence production of India.
  - 2) Explain with examples "The principles of Logistics".

P.T.O.





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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**DEFENCE AND STRATEGIC STUDIES (Paper – IX)**  
**DS-349 (B) : Internal Security of India – II (Optional) (Elective – IX)**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

**N.B. :** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*

1. Answer in **2 to 4** sentences **each** : **16**
    - 1) How you would like to Define Terrorism ?
    - 2) What are the dimensions of internal security of India ?
    - 3) What do you mean by Cross Border Terrorism ?
    - 4) Write the meaning of Secessionist force.
    - 5) Define Insurgency.
    - 6) What are the elements of state ?
    - 7) How you would like to define humane security ?
    - 8) Define Ethnicity.
  
  2. Answer in **8 to 10** sentences **each (any two)** : **8**
    - 1) Explain role of Media in internal security of India.
    - 2) Discuss on socio-ethnic dimension of internal security of India.
    - 3) Write a note on importance of food security.
  
  3. Write short notes on **(any two)** : **8**
    - 1) Cross Border terrorism.
    - 2) Role of N.G.O. in internal security of India.
    - 3) Role of the state in human security.
  
  4. Answer in **18 to 20** sentences **(any one)** : **8**
    - 1) Write a note on India's land border and its management.
    - 2) Evaluate internal security challenges of India.
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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**DEFENCE AND STRATEGIC STUDIES (Paper – IX)**  
**DS-349 (C) : India's Maritime Security – II (Optional) (Elective – IX)**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

**N.B. :** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*

1. Answer in **2 to 4** sentences **each** : **16**
  - 1) How you would like to Define Maritime Security ?
  - 2) What do you mean by Strategic Environment ?
  - 3) What do you mean by Threat Perception ?
  - 4) Write the meaning of Secessionist force.
  - 5) How you would like to Define Globalization of Terrorism ?
  - 6) Write any two difficulties in combating Terrorism.
  - 7) What do you mean by Zone of peace ?
  - 8) Define Exclusive Economic Zone (EEZ).
  
2. Answer in **8 to 10** sentences each (**any two**) : **8**
  - 1) Explain role of sea power in present day.
  - 2) Discuss strategic significance of Indian Ocean.
  - 3) Explain Policies of U.S.A. in the Indian Ocean.
  
3. Write short notes on (**any two**) : **8**
  - 1) Threat to maritime trade of India.
  - 2) Policies of Pakistan in the Indian Ocean.
  - 3) Humane Trafficking.
  
4. Answer in **18 to 20** sentences (**any one**) : **8**
  - 1) Explain 26/11 Mumbai attack and its impact on Indian security system.
  - 2) Discuss Indian Ocean as a Zone of peace : Problems and dimensions.





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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**ENVIRONMENTAL SCIENCE (Paper – I)**  
**ENV 341 : Aquatic Ecosystems and Management**  
**(New Course) (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- Instructions :**
- 1) **All questions are compulsory.**
  - 2) **Neat and labeled diagrams must be drawn wherever necessary.**
  - 3) **Figures to the right indicate full marks.**

1. Attempt the following in **1-2** lines **each**. **10**
  - a) Define limnology.
  - b) Differentiate between lentic and lotic systems.
  - c) Mention any 2 services offered by the aquatic ecosystem.
  - d) Name any two estuarine ecosystems.
  - e) What is eco-development ?
  - f) Define mangroves.
  - g) Enlist any 2 zooplankton from the freshwater system.
  - h) Write the full form of GIS.
  - i) Name any 2 significant aquatic resources in India.
  - j) What is eco-tone ?
  
2. Write a short note on (**any two**) : **10**
  - a) Adaptive restoration of wetlands.
  - b) Aquatic biota
  - c) Aesthetic and cultural benefits of wetlands.

P.T.O.



3. Answer **any two** from the following : **10**

- a) Elaborate on the role of local people in wetland management.
- b) Discuss the distribution of major aquatic systems in India.
- c) Explain the method adopted for Chilika restoration.

4. Attempt **any one** of the following : **10**

- a) What do you mean by an Interaction ? How does it play significant role in marine ecosystem ? Explain with suitable examples.
- b) Discuss the traditional and advance methods of water management. Compare its success with suitable case studies.

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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**ENVIRONMENTAL SCIENCE (Paper – II)**  
**ENV – 342 : Nature Conservation**  
**(New Course) (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) **All** questions are **compulsory**.  
2) **Neat** and labeled diagrams must be drawn **wherever** necessary.  
3) Figures to the **right** indicate **full** marks.

1. Attempt the following in **1-2** lines **each**. **10**
- a) What are Protected Areas ?
  - b) Name any 2 biodiversity hotspots.
  - c) Write the full form of WWF.
  - d) What is the state tree of Maharashtra ?
  - e) What are seed banks ?
  - f) Name any 2 protected bird species of India.
  - g) Write the full form of MoEF and cPCB.
  - h) Name any 2 IUCN threatened categories.
  - i) The Convention on Wetlands of International Importance is famously known as \_\_\_\_\_ Convention.
  - j) Define Ex-situ conservation.
2. Write a short note on (**any two**) : **10**
- a) Landscape / Habitat / Ecosystem approach for nature conservation.
  - b) Schedules according to Wildlife Protection Act.
  - c) Project Crocodile Breeding and Management.

P.T.O.



3. Answer **any two** from the following : **10**

- a) Explain the importance and methods for awareness about conservation.
- b) What are the national initiatives taken for nature conservation ? Describe.
- c) Describe the concept of gene bank with example. Give its merits, limitations and challenges.

4. Attempt **any one** of the following : **10**

- a) Describe any 5 international efforts for nature conservation.
- b) Explain traditional conservation practices with suitable examples. Describe its merits, limitations and challenges.

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**T.Y. B. Sc. (Semester – IV) Examination, 2012  
ENVIRONMENTAL SCIENCES (Paper – VI)  
ENV 346 : Environmental Biotechnology – II  
(2008 Pattern) (New Course)**

Time : 2 Hours

Max. Marks : 40

**Instructions :** 1) **All** questions are **compulsory**.

2) **Neat** and labelled diagrams must be drawn **wherever** necessary.

3) Figures to the **right** indicate **full** marks.

1. Attempt the following in **1-2** lines **each**.

**10**

- a) State two uses of Biomethane.
- b) Name the two bacteria used in Bioleaching.
- c) What are recalcitrant compounds ?
- d) Differentiate Bioremediation and Biodegradation.
- e) Define 'Activated Sludge'.
- f) What is immobilisation ?
- g) UASB stands for :
- h) Name the biomaterial used for Biosorption of metal.
- i) What is hazardous waste ?
- j) What is CSTR ?

P.T.O.





2. Write a short note on (**any two**) : **10**
- a) Biomining
  - b) Rhizofiltration
  - c) Phosphate removal.
3. Answer **any two** from the following : **10**
- a) Discuss the disposal of solid waste.
  - b) How is sewage waste water treatment differs from industrial waste water treatment ?
  - c) Describe the problems in Biomethannation.
4. Attempt **any one** of the following question. **10**
- a) Discuss the application of immobilized cells or enzyme for solving water pollution problems.
  - b) Describe in detail aerobic treatment of wastewater.



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**T.Y. B.Sc. (Semester – IV) Examination, 2012  
INDUSTRIAL CHEMISTRY (Vocational)  
Entrepreneurship Development (Paper – V)  
(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

**N.B. :** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*

1. Answer precisely the following : 10
- a) Who is an intrapreneur ?
  - b) What is the biggest difference between enterprise and employment ?
  - c) What is risk bearing ?
  - d) Define the term Cost Accounting.
  - e) Define the term Valuation Date under Wealth Tax Act.
  - f) What is an industrial development bank ?
  - g) What is seed capital ?
  - h) Define 'Project'.
  - i) What is innovation ?
  - j) What is MCED ?
2. A) Answer the following (**any two**) : 6
- a) What do you mean by financial statement ?
  - b) List out the features of IDBI.
  - c) Explain any two sales promotion methods.

P.T.O.



- B) Answer briefly the following (**any two**) : **4**
- a) List out four types of media of advertising.
  - b) Explain SWOT analysis with reference to project identification.
  - c) Who are the key managerial personnel of DIC ?
3. Answer the following (**any two**) : **10**
- a) What is the importance of leadership skills for an entrepreneur ?
  - b) What are the stages of promoting a new venture ?
  - c) What is circular flow of working capital ?
4. a) Differentiate between sole proprietorship and partnership. **6**
- OR
- a) How does one overcome barriers to entrepreneurship ? **6**
  - b) Answer the following (**any one**) : **4**
    - i) What is marketing research ?
    - ii) What is the scope of human resource in modern industry ?
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**T.Y. B.Sc. (Semester – IV) Examination, 2012  
SEED TECHNOLOGY (Vocational)  
Paper – V : Entrepreneurship Development  
(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

**Instructions :** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*  
3) *Sketch neat labeled figures wherever necessary.*

1. Answer the following : **(1×10=10)**

- a) What is the concept of entrepreneurship ?
- b) Give the merit in partnership.
- c) What do you mean by marketing mix ?
- d) Mention any one source of finance.
- e) Mention any one criterion used for selection of new product.
- f) Write the full form of SIDBI.
- g) Mention any one channel for marketing.
- h) What is meant by VAT ?
- i) What is patent rule ?
- j) What do you mean by sole proprietorship ?

2. Attempt **any two** of the following : **(2×5=10)**

- a) Write an account on key elements of entrepreneurship.
- b) Write a note on Maharashtra Industrial Development Corporation (MIDC).
- c) Give an account of marketing strategy.

P.T.O.



3. Write short notes on **any two** of the following : **(2×5=10)**

- a) Characteristics of an entrepreneur.
- b) Communication skills.
- c) Entrepreneurial culture.

4. Explain in detail the criteria and ideas required for the development of Entrepreneurship. **10**

OR

Write in detail about any two funding agencies.

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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**(Vocational)**  
**INDUSTRIAL MICROBIOLOGY (Paper – V)**  
**IND-MIC-345 : Molecular Biology and Recombinant DNA Technology**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- N.B :** 1) *All questions are compulsory.*  
2) *All questions carry equal marks.*  
3) *Draw neat, labelled diagram wherever necessary.*  
4) *Figures to the right indicate full marks.*

1. Answer the following : 10
- a) What is restriction digestion mapping ?
  - b) Diagrammatically represent recognition site and cutting site of Hae III enzyme.
  - c) Write two examples of radioactive labels used for DNA labeling.
  - d) Write the markers present on plasmid pBR 322.
  - e) Name two nucleic acid hybridization blotting techniques.
  - f) Represent diagrammatically only : Action of DNA ligase.
  - g) Write **True** or **False** with reason :  
*E coli* M 15 mutant is used for blue white screening for selection of desired clones.
  - h) In Maxam Gilbert's method \_\_\_\_\_ is used for detection of base G.
  - i) Write the principle of Real time PCR.
  - j) During plasmid DNA extraction, denaturation of linear DNA but not cccDNA occurs in the pH range \_\_\_\_\_.

P.T.O.



2. Attempt **any two** of the following : **10**
- a) Justify: During Human genome project, high capacity vectors like artificial chromosomes were developed.
  - b) Write the importance of Restriction Endonuclease type II in gene manipulation.
  - c) Write the principle and applications of Agarose gel electrophoresis.
3. Attempt **any two** of the following : **10**
- Comment on :
- a) Importance of sticky ends in gene cloning.
  - b) Recently developed recombinant vaccines.
  - c) Northern blotting technique.
4. Attempt **any one** of the following : **10**
- a) What is PCR ? Elaborate on its principle, working and applications.
  - b) What is Genomic DNA library ? Describe the methods used for developing such library and give its significance.



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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**BIOTECHNOLOGY (Vocational)**  
**Paper – VI : Microbial Biotechnology and Animal Biotechnology**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- Instructions :**
- 1) **Neat** diagrams must be drawn.
  - 2) **All** questions carry **equal** marks.
  - 3) **All** questions are **compulsory**.

1. Answer the following question in short : **10**
- a) What is COD ?
  - b) Name two commercially important enzymes.
  - c) Give two types of vinegar.
  - d) Define cell line.
  - e) What is interferon ?
  - f) Define 'patent'.
  - g) Enlist the components of HAT medium.
  - h) What is sufu ?
  - i) Give the importance of tPA.
  - j) What is anchorage dependence ?
2. Attempt **any two** of the following : **10**
- a) What are DNA vaccines ?
  - b) Describe the production of streptomycin.
  - c) Explain the primary separation of desired product of fermentation.

P.T.O.





3. Write notes on **any two** : **10**

- a) Production of monoclonal antibodies
- b) Knock outs
- c) Batch fermentation.

4. Attempt **any one** of the following : **10**

- a) What is factor VIII ? What is its biological importance ? How is it produced on mass scale ?
- b) What is cell immobilization ? Enlist the methods used for cell immobilization. Describe any one in detail.

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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**PHOTOGRAPHY AND AUDIO-VISUAL PRODUCTION (Vocational)**  
**Paper – VI : Radio Software**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- Instructions:** 1) Attempt **any four** questions.  
2) Give suitable examples **wherever** necessary.  
3) Figures to the **right** indicate **full** marks.

1. Explain with suitable examples the challenges for producing a radio programme. **10**
2. Anchor is an important person in a discussion programme. How ? **10**
3. What is an O.B. programme ? What care should be taken to broadcast a live O.B. programme ? **10**
4. What are the differences between radio and print communication ? **10**
5. What is the role of an interviewer in an interview programme ? **10**
6. Discuss the importance of the broadcast code. **10**

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B/1/12/85



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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**Computer Hardware and Network Administration (Vocational)**  
**Paper – VI : NETWORK CONCEPTS – II**  
**(New Course) (2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

**Instructions :** 1) *All questions are compulsory.*  
2) *Figures to the right indicate full marks.*

1. a) Attempt **all** of the following : **(10×1=10)**
- i) What is a Antivirus ?
  - ii) What is Data Encryption ?
  - iii) What is a MODEM ?
  - iv) What is a Gateway ?
  - v) What is a VLAN ?
  - vi) Give one application of VOIP.
  - vii) What is Router ?
  - viii) What is a Shared Drive on Network ?
  - ix) What is a Broad Band ?
  - x) Give one application of a VPN.
2. Attempt **any two** of the following : **(2×5=10)**
- a) Write a note on Resource planning of a Hardware.
  - b) Explain the advantages of VOIP.
  - c) Explain the advantages of a Firewall in the Network.

P.T.O.



3. Attempt **any two** of the following : **(2×5=10)**

- a) What is a proxy server ? Explain its use in internet sharing.
- b) Give the steps to share a Printer on Network.
- c) What is a remote access VPN ? And give its one application.

4. Attempt **any one** of the following : **(1×10=10)**

- a) Write the Installation Procedure for an Ethernet Card and configuring TCP/IP Protocol in Windows XP.
- b) What are the different Data Protection Measures ? Explain any one in detail.





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**T.Y. B. Sc. (Semester – IV) Examination, 2012  
SEED TECHNOLOGY (Vocational) (Paper – VI)  
Biotechnology and Intellectual Property Rights  
(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

**Instructions :** 1) *All questions are compulsory.*

2) *Figures to the right indicate full marks.*

3) *Draw neat and labeled diagrams wherever necessary.*

1. Answer in **one** sentence each. **(1×10=10)**
- a) Give any two branches of Biotechnology.
  - b) What is meant by RFLP ?
  - c) Give any two names of seed storage proteins.
  - d) What is DNA hybridization ?
  - e) Enlist the steps of PCR.
  - f) What is tissue culture ?
  - g) Define transgenic.
  - h) What do you mean by Intellectual Property Right ?
  - i) Define inoculation.
  - j) What is World Trade Organization ?

P.T.O.



2. Answer the following (**any two**) : **(5×2=10)**

- a) Applications of Biotechnology.
- b) Isolation of Seed Storage Proteins.
- c) Embryo Culture.

3. Write notes on **any two** of the following : **(5×2=10)**

- a) Golden Rice
- b) ELISA
- c) Intellectual Property Right in India.

4. What is RAPDs ? Explain it with reference to varietal identification. **(10)**

OR

What is micro propagation ? Explain in detail steps involved in anther culture.

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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**STATISTICS (Principal) (Paper – VI)**  
**ST-346 (C) : Statistical Computing using ‘R’ Software**  
**Batch No-I (On Line Paper)**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- Instructions :**
- 1) **All** questions are **compulsory**.
  - 2) Figures to the **right** indicate **full** marks.
  - 3) **Each** question is to be solved using **R** software installed on your computer.
  - 4) **Attach** computer printout of your work to the **answer** book supplied to you.

1. Attempt **each** of the following :

a) Create a vector of integers between 1 and 100 which are divisible by 6.

b) Find mean and medium of following observations

27, 25, 13, 9, 20, 16, 14, 8, 2, 6, 14.

c) Draw a rod plot for the following data :

<b>x</b>	2	3	5	7	9	12
<b>f</b>	4	12	16	25	14	3

d) Draw a simple random sample without replacement of size 10 from a population of 50 units.

e) Let  $X \sim P(\lambda = 2.5)$ . Find  $P(X \leq 3)$ ,  $P(X = 5)$ .

P.T.O.



- f) Simulate an experiment of tossing a coin 100 times and prepare its frequency distribution.
- g) Draw a random sample of size 7 from a  $N(\mu = 20, \sigma^2 = 10)$  distribution.
- h) Create a data frame of roll number and fees paid by 10 students.
- i) Access data CO<sub>2</sub> and obtain its summary statistics.
- j) Draw a box plot of following observations
- 92, 75, 13, 29, 41, 35, 67, 59, 42, 38, 29, 10, 17, 61, 43. (1 each)

2. Attempt **any two** of the following :

- a) Draw less than and more than ogive curve for the following data.

length of screw (cms)	No. of screws
2.0 – 2.5	13
2.5 – 3.0	25
3.0 – 3.5	12
3.5 – 4.0	28
4.0 – 5.0	37
5.0 – 5.5	10
5.5 – 6.0	4





b) Fit a binomial distribution to the following data.

<b>x</b>	0	1	2	3	4	5
<b>f</b>	2	13	19	27	15	3

Plot observed and expected frequencies and comment on adequacy of model.

c) Find coefficient of variation using the following data. **(5 each)**

<b>x</b>	12	23	33	35	38
<b>f</b>	7	12	11	8	2

3. Attempt **any two** of the following :

a) Draw subdivided bar diagram for the following data.

<b>Year</b>	<b>No. of students in</b>		
	<b>F.Y.</b>	<b>S.Y.</b>	<b>T.Y.</b>
<b>1999</b>	250	190	125
<b>2003</b>	320	250	220
<b>2005</b>	270	200	155

b) A random sample of 7 school boys had the following weights (kg).

47, 51, 45, 42, 50, 42, 39.

Can we conclude at 5% level of significance that average weight of a boy is 40 kg ?

c) Obtain first three central moments and measure of skewness ( $\gamma_1$ ) for the following data on height (cms) of 10 students.

142, 150, 151, 149, 135, 139, 158, 160, 140, 150.

**(5 each)**



4. Attempt **any one** of the following :

a) i) Fit a second degree parabola to the following data.

<b>x</b>	2	4	6	8	10	12
<b>y</b>	23	26	35	39	42	16

ii) A manufacturer claims that 4% of the items produced are defective. In a random sample of 400 items it is found that 14 items are defective. Test the manufacturer's claim at 5% l.o.s. **(5+5)**

b) i) The monthly sales (in '000 Rs.) of three salesmen X, Y and Z were recorded as follows :

<b>X</b>	10, 12, 14, 9, 6
<b>Y</b>	15, 16, 10, 8, 14, 10
<b>Z</b>	9, 12, 16, 15

Carry out the analysis of variance.

ii) Two machines A and B were tested according to the time required to complete a particular job.

<b>A</b>	25, 27, 16, 22, 18, 23
<b>B</b>	16, 27, 15, 20, 19, 12, 17

Test the variability in time required by two machines using F-test. **(5+5)**

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**T.Y. B.Sc. (Semester – IV) Examination, 2012**  
**STATISTICS (Principal) (Paper – VI)**  
**ST-346 (C) : Statistical Computing Using “R” Software**  
**Batch No. 2 (online Paper)**  
**(2008 Pattern)**

Time : 2 Hours

Max. Marks : 40

- Instructions :**
- 1) **All questions are compulsory.**
  - 2) **Figures to the right indicate full marks.**
  - 3) **Each question is to be solved using R software installed on your computer.**
  - 4) **Attach computer printout of your work to the answer book supplied to you.**

1. Attempt **each** of the following :

- a) Create a vector (x) of observations 2, 5, 7, 10, 12, 9, 8. From x create vector y containing elements of x greater than 7.
- b) Simulate an experiment of tossing a die 50 times and prepare its frequency distribution.
- c) Draw a systematic sample of size 5 from a population of 35 units.
- d) Let  $X \sim N(\mu = 50, \sigma^2 = 20)$ . Find  $P(40 \leq X \leq 90)$ .
- e) Draw a random sample of size 5 from a P ( $\lambda = 4.7$ ) distribution.
- f) Find mean and mode of following observations :  
5, 9, 6, 7, 12, 5, 11, 15, 5, 7, 5, 8
- g) Access data cars and obtain its summary statistics.
- h) Draw box of blot of following observations : 15, 17, 29, 37, 5, 12, 45, 16, 29, 32, 18
- i) Let  $X \sim B(n = 10, p = 0.4)$ . Find  $P(X < 3)$ ,  $P(X \geq 7)$
- j) Create a data frame of item name and its price for 5 items. **(1 each)**

P.T.O.



2. Attempt **any two** of the following :

a) Draw histogram and frequency polygon for the following frequency distribution.

Life (in hrs.)	No. of Bulbs
400-450	12
450-500	42
500-550	39
550-600	17
600-700	3

b) Compute arithmetic mean, geometric mean and harmonic mean for the following data :

15, 12, 9, 6, 32, 18, 10, 19, 25, 16. Verify the relation between them.

c) Following are the data on the time (in mts.) required to fill the bottles by two machines A and B.

**A** : 5, 9, 7, 8, 5.7, 7.5, 8.1

**B** : 7.5, 3.5, 8, 7.5, 3.9, 4.5, 8.1

Can we conclude that average time required by two machines is same. Take  $\alpha = 0.05$ .

**(5 each)**

3. Attempt **any two** of the following :

a) Represent the following data by Simple bar diagram.

Year	2002	2003	2004	2005	2006
Profit ('000 Rs.)	12	15	14	19	16



b) Fit a normal distribution to the following data :

<b>Height (cms)</b>	140-150	150-160	160-170	170-175	175-180
<b>No. of Students</b>	12	19	47	15	6

c) Calculate quartile deviation for the following data :

<b>Marks</b>	0-5	5-10	10-15	15-25	25-30
<b>No. of Students</b>	7	23	52	16	4

(5 each)

4. Attempt **any one** of the following :

a) i) A die is tossed 100 times and the results obtained are as given below :

<b>No. turned up</b>	1	2	3	4	5	6
<b>Frequency</b>	25	16	20	10	16	13

Test the hypothesis that die is unbiased.

ii) Fit a straight line  $y = a + bx$  to the following data :

<b>X</b>	50	55	62	65	49	70	63
<b>Y</b>	70	72	90	80	55	72	60

Also find correlation coefficient between X and Y.

(5+5)



- b) i) A tea company appointed 3 salesmen A, B and C and observed their sales (in lakh Rs.) in 3 districts I, II and III as given below :

Salesman District	A	B	C
I	20	12	17
II	18	21	15
III	17	9	8

Perform two way analysis of variance using the above data.

- ii) Draw a pie chart for the following data

Commodity	A	B	C	D	E
Consumption (Quintals)	25	18	9	4	2

(7+3)