[4218] – 1

F. Y. B. Sc. (Computer Science) Examination, October – 2012
COMPUTER SCIENCE
(Paper - I)
11111 – Introduction to Programming
and 'C' Programming
(2008 Pattern)

Time : Three Hours   **Total Marks : 80**

Note :   *(i)*   ***All*** *questions are compulsory.*

        (ii)   *Figures in bold type to the right indicate full marks.*

        (iii)   *Neat diagrams must be drawn wherever necessary.*

Q. 1. Answer **all** of the following questions :   **[10]**

   (i)   What is System Software?

  (ii)   What are the features of low level languages?

 (iii)   'C' is middle level language – Comment.

 (iv)   What is escape sequence for vertical tab?

   (v)   Give syntax and use of size of operator.

 (vi)   Which function is used to calculate X^Y in 'C' from math.h library? Give syntax.

 (vii)   State the difference between actual and formal parameters.

(viii)   Given the macro definition

      # define   CUBE(x)   x*x*x

      What will be the o/p of following statement?

      printf("%d", CUBE(3+3+0));

(ix) Explain the use of file opening modes "w" and "w+".

(x) Explain the difference between bitwise OR and logical OR operators with example.

Q. 2. Answer the following questions **(Any Four)** :   **[20]**

(i) Explain the types of constants in 'C'.

(ii) Explain any five functions from library ctype.h.

(iii) Explain the working of switch-case with syntax.

(iv) What is the difference between malloc( ) and calloc( )?

(v) Write syntax and explain the use of the following functions :

    (a)   getc( )

    (b)   fgetc( )

    (c)   fgets( )

    (d)   getw( )

    (e)   fscanf( )

Q. 3. Answer the following questions. **(Any Four)** :   **[20]**

(i) Write an algorithm and draw a flowchart to find the largest of the 3 numbers.

(ii) What is the o/p of the following program :

```
main( )
{
int  x = 5,  y = 10;
predict(x,  &y);
printf("%d %d", x, y);
}
```

```
void predict (int a, int *b)

{

        a = 20 ;

      *b = 30 ;

}
```

(iii) Find and justify o/p of the following program :

```
main( )

{

      abc(100,  200);

}

abc(int  n)

{

      printf("%d", n);

}
```

(iv) Write a program using recursive function to print sum of digits of a given number.

(v) Find and justify o/p of the following :

```
main( )

{

        static int num[10] = {1, 0, 0, 0, 0, 0, 0, 0, 0, 0};

        int i, j ;

        for(j = 0 ; j < 10 ; ++ j)

            for(i = 0 ; i < j ; ++ i)

            num[j] = num[j] + num[i] ;

            for( i = 0; i < 10 ; i ++)

            printf("%d\n", num[i]);

}
```

Q. 4. Answer the following questions :   **[20]**

    (i)   Write a program to generate first 'n' terms of fibonacci series.

    (ii)   Write a program to display the following pattern :

          A   B   C   D

          A   B   C

          A   B

          A

    (iii) Write a program to print addition of two matrices.

    (iv) Write a program to concat two strings without using standard library function. Use dynamic memory allocation to accept strings.

    (v)   Write a program to accept students' information (Roll no., name, percentage of marks) for 'n' students. Store this in file and display it in well format (Use of structure and fwrite( ) & fread( ) functions are expected.

Q. 5. Answer the following questions. **(Any Two)** :   **[10]**

    (i)   What is the difference between Function and Macro?

    (ii)   Write a short note on :

          (a)   Pointer to function

          (b)   Function pointer

    (iii) Explain the following :

          (a)   Nested structure

          (b)   File inclusion directive

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F. Y. B. Sc. (Computer Science) Examination, October – 2012

COMPUTER SCIENCE
(Paper - II)
11112 – File Organisation and
Fundamentals of Databases
(2008 Pattern)

Time : Three Hours　　　　　　　　　　　　**Total Marks : 80**

Note :　　*(i)　**All** questions are compulsory.*

　　　　　　(ii)　Figures to the right indicate full marks.

　　　　　　(iii)　Neat diagrams must be drawn wherever necessary.

　　　　　　(iv)　Assume suitable data, if necessary.

Q. 1. Answer the following questions (**Any Ten**) :　　　　　　　　**[10]**

　　(i)　Define Physical file.

　　(ii)　'Sorted file is best if range selection is desired' — Comment.

　　(iii)　Discuss the disadvantages of DBMS.

　　(iv)　What is the purpose of GRANT and REVOKE statement. Give syntax.

　　(v)　Define Candidate key.

(vi) Explain one-to-many relationship with example.

(vii) Give syntax and example of Join relational operator.

(viii) Write a relational algebra query to select students having grade 'B' from student database (roll no., name, marks, grade).

(ix) List the datatypes supported by SQL.

(x) What is the use of having clause in SQL?

(xi) Give example of lossless and dependency preserving decomposition.

(xii) Define partial dependency.

Q. 2. Answer the following question **(Any Four)** :   **[20]**

(i) Compare variable length record and fixed length record.

(ii) Explain B^+ tree index structures.

(iii) Which are problem cost by redundency?

(iv) Discuss the following with example :

(a) Binary relationship

(b) Unary relationship

(c) Ternary relationship

(v)   Consider the set of FD's F, defined for relation R(A,B,C,D,E,F) as

F = {AB→ C, C→A, BC→D, ACD→B, BE→C, CE→FA, CF→BD, D→EF}

Find canonical cover Fc.

Q. 3. Answer the following questions. **(Any Four)** :   **[20]**

(i)   What are the consequences of bad database design? Explain with example.

(ii)   What is entity relationship diagram? Discuss different elements of E-R model.

(iii)   Normalize the following relation into 3NF :

plant_name, cust_code, plant_code, plant_type, plant_price, cust_name, no plant, cust_address.

(iv)   Write a short note on Data abstraction.

(v)   Consider the following relation :

Employee (Fname, init, Lname, SSN, Bdate, Addr, Sex, Salary, Supurssn, Dno)

Department (Dname, Dno, mqrssn, mqrstartdate)

Dept-location (Dno, Dlocation)

Project (pname, pno, plocation, dnum)

Work_on (ESSN, pno, Hour)

Dependent (ESSN, Dependent – name – sex, Bdate, Relationship)

Solve the queries in relational algebra :

(i)   Select all employee tuple whose department is 10.

(ii)   Select employee tuple whose salary is greater than Rs. 30,000.

(iii)   List each employee's first and last name and salary.

(iv)   Retrieve the first name, last name and salary of all employees who work in department no = 10.

(v)   Retrieve the name of manager of each dept.

Q. 4. Answer the following questions **(Any Four)** :   **[20]**

(i)   Consider the following relation :

Employee (empno, empname, salary, comm.., designation)

Department (deptno, deptname, location)

Employee and Department are related with many to one relation-ship. Create RDB for above and solve queries in SQL :

(a)   Find out employees who are working at Shrirampur location.

    (b)   Find the maximum, minimum and average salary for every designation.

    (c)   Update commission for every employee by 5% who belong to Computer Department.

(ii) Consider the following relation :

Sales_order (s_order, s_order_date)

Client (client_no, name, address)

A client can give one or more sales_orders, but sales_order belongs to exactly one client.

Create RDB for above and solve the following queries in SQL :

    (a)   Change the order date of client_no 'C004' to 11/01/2012.

    (b)   Find out the sales_order of Mr. Ambare client.

    (c)   List the name of all client in sales_order_date.

(iii) Consider the following relation :

Emp (emp_id, emp_name, address, bdate)

Investor (inv_name, inv_no, inv_date, inv_amt)

Emp and Investor one to many relationship, create RDB for above and solve the following SQL queries :

(a)   List the names of employees who are not investors.

(b)   Find the distinct names of customers who are either employees or investor or both.

(c)   Find the Inv_amt of particular employee whose Inv_date '10/01/2012'.

(iv)   Consider the following relation :

Doctor (dno, dname, address, city)

patient (pat_no, pat_name, addr, disease)

Doctor and patient are related with many to many. Create RDB in above and solve the following SQL queries:

(a)   Find the no. of patients suffering from "Asthma".

(b)   Find the no. of patients visited by "Dr. Padhghan".

(c)   Delete all patients record suffering from "Diabetes".

(v)   Consider the following relations :

Game (g_no, g_name, no_of_players, coach_name, captain)

Players (p_no, p_name).

Game and players are related with many to many relationship:

(a)   List the name of players playing "basketball" and "handball".

(b)   Count the total no. of players whose coach name is "Mr. Ambre".

Q. 5. (a)   In 'Banking Enterprises', which record information about   **[10]** customers, employees of bank. A customer can be depositor or borrower. An employee of bank can be customer of bank. There are two types of accounts : saving account or current account.

(i)   Draw Entity Relationship Diagram.

(ii)   Convert E-R Diagram in 3NF.

(b)   Give Armstrong's Axioms.

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OR

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(b)   Explain the concept of overflow pages in ISAM.

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F. Y. B. Sc. (Computer Science) Examination, October – 2012

MATHEMATICS

Paper - I

11211 – Discrete Mathematics

(2008 Pattern)

Time : Three Hours   **Total Marks : 80**

Note :   *(i)*   *All questions are compulsory.*

         (ii)   *Figures to the right indicate full marks.*

        (iii) *Neat diagrams must be drawn wherever necessary.*

Q. 1. Attempt **all** of the following questions :   **[16]**

    (i)   State second principle of mathematical induction.

    (ii)   Write negation of each of the following statements :

        (a) $\exists x (P(x) \wedge \sim Q(x))$

        (b) $\forall x (P(x) \wedge Q(x))$

    (iii) How many strings of three decimal digits, with repititions

        allowed,

        (a)   that begin with an odd digit.

        (b)   have exactly two digits that are 4's.

(iv) Find first six terms of the sequence defined by the following

recurrence relation :

$$a_n = a_{n-1} + 3a_{n-2}; \; a_0 = 1, a_1 = 2$$

(v) Write definitions of :

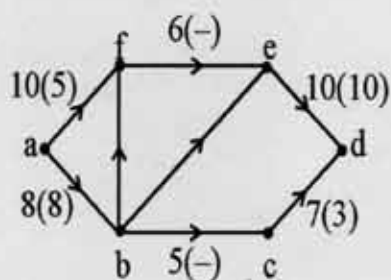   (a) complete bipartite graph.

    (b) arboresence.

(vi) Determine whether there exists a graph with the following
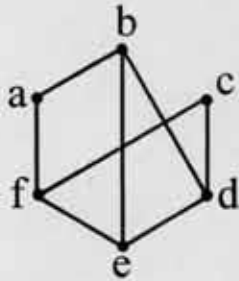
degrees :

5, 4, 3, 2, 1

(vii) Find the missing figures in the following network and given

flow in it.

(Figures in the brackets indicate flow and other figures indicate

capacity).

(viii) Draw complement of the following graph :

Q. 2. Attempt **any four** of the following :   **[16]**

(i)   Use mathematical induction to prove that

$$1 \cdot 1! + 2 \cdot 2! + \ldots\ldots + n \cdot n! = (n+1)! - 1$$

for all $n \geq 1$.

(ii) Determine if the following propositions are tautologies and

justify your answer.

(a) $(\sim q \wedge (p \rightarrow q)) \rightarrow \sim p)$

(b) $((p \vee q) \wedge \sim p) \rightarrow q)$

(iii) Solve the recurrence relation :

$$a_n = -4 a_{n-1} - 4 a_{n-2}; \; a_0 = 0 \text{ and } a_1 = 1.$$

(iv) Sort the following array by using Bubble sort :

$\langle 7, 0, 2, 10, 5 \rangle$

(v) Find the number of strings of eight English letters —

   (a)   that contain no vowels, if letters can be repeated.

   (b)   that starts with the letter 'x' and contains at least one vowel,

         if letters can be repeated.

(vi) If 10 points are chosen in a square whose sides have length 3,

      then show that there must be at least two points which are at most

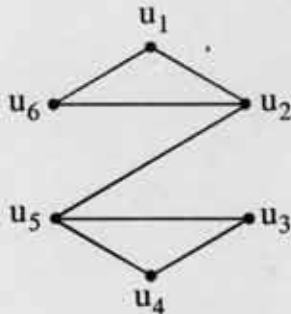 $\sqrt{2}$ distance appart.

Q. 3. Answer **any four** of the following :   [16]

   (i)   Give an example of a graph with vertex connectivity $k(G) = 4$

         and edge counectivity $\lambda(G) = 5$. Justify your answer.

   (ii) Determine if the following graphs G_1 and G_2 are isomorphic.
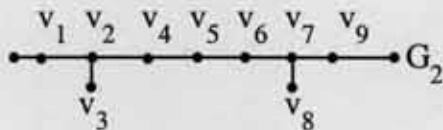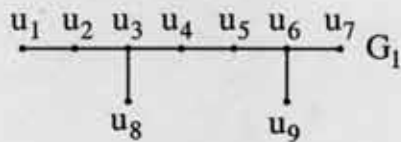
(iii) Find eccentricities of all vertices of the following graph :

Hence find center of the given graph.

(iv) Draw the arboresence and hence write the following algebraic

expression in Polish notation :

$$(x+y)^2 + \frac{x-4}{3}$$

(v) Prove that a tree on n vertices has (n–1) edges.

(vi) Prove that a graph G is connected if and only if for every pair

of distinct vertices u and v in G, there exists a path in between

them.

Q. 4. Attempt **any two** of the following :   [16]

(i)   How many positive integers less than or equal to 1000 are

divisible either by 3 or 5 or 11?

(ii) Discuss the validity of the following argument :

Either Hari attends the lecture or he watches the movie. If Hari attends the lecture, then he will have a cup of coffee. Hari will go to hotel, if he watches the movie. Therefore, either Hari will have a cup of coffee or he will go to hotel. (A, B, C, D).

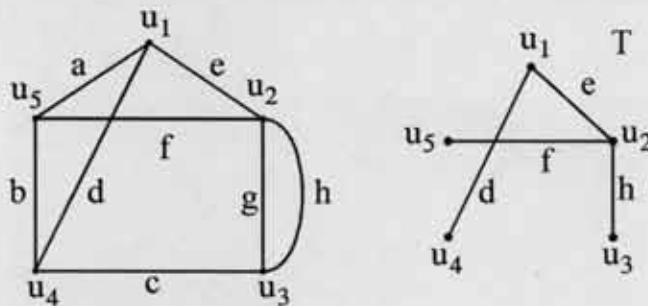(iii) Solve the following recurrence relation :

$$a_n = a_{n-1} + 2a_{n-2} + n; \ a_0 = 0, a_1 = 1.$$

(iv) State and prove the addition principle.

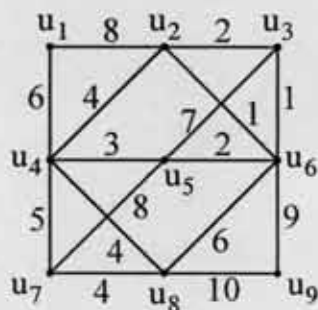**Q. 5.** Attempt **any two** of the following :   [16]

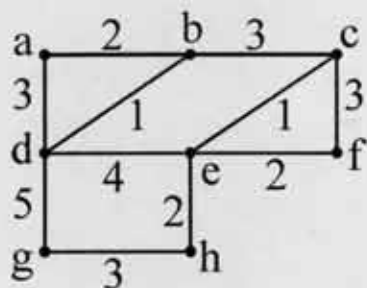(i) Consider the following graph G and its spanning tree T.

Find all fundamental circuits and cutsets of G with respect to T.

(ii) Use Kruskal's algorithm to find a minimum spanning tree of the following weighted graph.

(iii) Use Dijkstra's algorithm to find a shortest path from vertex 'a' to vertex 'h' in the following weighted graph :

(iv) If G is a connected graph, then prove that

$k(G) \leq \lambda(G) \leq \delta(G)$;

Where $k(G)$ denotes the vertex connectivity of G, $\lambda(G)$ denotes edge connectivity of G and $\delta(G)$ denotes the smallest degree of G.

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F. Y. B. Sc. (Computer Science) Examination, October – 2012

MATHEMATICS

Paper - II

11212 – Algebra and Calculus

(2008 Pattern)

Time : Three Hours   **Total Marks : 80**

Note :   *(i)*   *All questions are compulsory.*

(ii)   *Figures to the right indicate full marks.*

(iii) *Neat diagrams must be drawn wherever necessary.*

Q. 1. Attempt **all** of the following questions :   **[16]**

(i)   Give an exmaple of a relation on the set A = {a, b, c} which is symmetric but not transitive. Justify your answer.

(ii)   Determine all the atoms in lattice D_{30}.

(iii) Let A = {a, b} and consider the relation on power set $\mathbb{P}(A)$ defined as xRy if and only if $x \subseteq y$. Draw the Hasse diagram of relation 'R'.

(iv)   For any two integers a and b having greatest common divisor d,

find $\left(\dfrac{a}{d}, \dfrac{b}{d} \right)$.

(v)   Evaluate : $\lim\limits_{n \to \infty} \sqrt{n+1} - \sqrt{n}$.

(vi)   Show that : $\sum\limits_{n=1}^{\infty} \dfrac{n+1}{n+2}$ is divergent.

(vii) Discuss the continuity of f(x), where

$$f(x) = \begin{cases} 2x+1 & \text{if } x \le 1 \\ x^2 & \text{if } 1 < x \le 2. \end{cases}$$

(viii) If $y = e^{2 \cdot x} \cdot \sin(x+5)$ then find y_n.

Q. 2. Attempt **any four** of the following :   ,   [16]

(i)   If 'R' is the relation on the set A = {1, 2, 3, 4} defined as 'xRy if and only if $x \ne y$ ", then draw diagraph of relation R and write the matrix of relation R.

(ii) Let R be the relation on the set of ordered pairs of positive integers defined as (a, b) R (c, d) if and only if a + d = b + c.

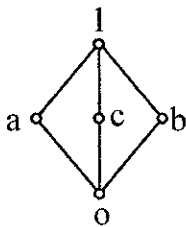   Determine whether R is an equivalence relation.

(iii) Find the remainder of 7^{456} when divided by 11.

(iv) Show that the relation 'a ≡ b (mod n) is an equivalence relation on $\mathbb{Z}$.

(v)   Find the complement, if exists, of every element in the lattice D_{45}.

(vi) Determine whether the lattice given by the following Hasse diagram is distributive.

Q. 3. Answer **any four** of the following :   [16]

(i)   Discuss the convergence of sequence $\langle a_n \rangle$ where

$$a_n = \left(1 + \frac{1}{n}\right)^n \quad \forall\, n \in \mathbb{N}.$$

(ii) Discuss the convergence of the series

$$\frac{\sqrt{2}}{3} + \frac{\sqrt{3}}{5} + \frac{\sqrt{4}}{7} + \ldots\ldots\ldots$$

(iii) Verify Rolle's Mean Value theorem for

$f(x) = (x-1)(x-2)(x-3)$ on $[0, 3]$.

(iv) Verify Cauchy's Mean Value theorem for the functions

$f(x) = x^2$, $g(x) = x^4$ in $[a, b]$ where a and b are positive real numbers.

(v)   Evaluate : $\lim\limits_{x \to \frac{\pi}{2}} \cos x^{\cos x}$

(vi) Assuming validity, obtain expansion of $f(x) = \sec x$ by Maclaurin's theorem upto x^4.

Q. 4. Attempt **any two** of the following :   [16]

(i)   Consider the set $x = \{1, 2, 3, 4\}$ and the following relation 'R' on X

$R = \{(1, 1)\,(1, 3)\,(1, 4)\,(2, 1)\,(2, 2)\,(3, 2)\,(3, 3)\,(4, 1)\}$

Use Warshall's algorithm to obtain transitive closure of R.

(ii) Find the greatest common divisor of the integers $m\,(7260) + n(1638)$; $m, n \in \mathbb{Z}$.

(iii) If $a \equiv b \pmod n$ and $c \equiv d \pmod n$, then prove that

     (a) $a + c \equiv b + d \pmod n$.

     (b) $a \cdot c \equiv b \cdot d \pmod n$.

(iv) Express the following Boolean expression in disjunctive normal form.

     $f(x, y, z) = (x \wedge y) \vee (x \wedge z) \vee (\bar{y} \wedge z)$.

Q. 5. Attempt **any two** of the following :   **[16]**

     (i)   State and prove Lagrange's Mean Value theorem. Explain geometric interpretation of Lagrange's Mean Value theorem.

     (ii)   State Leibnitz theorem. If $y = \sin^{-1} x$, then prove that

       $(1 - x^2) y_{n+2} - (2n + 1) \cdot x \cdot y_{n+1} - n^2 y_n = 0$

     (iii)   State Taylor's theorem with Lagrange's form of remainder. Express the function $f(x) = x^3 + 4x^2 + 3x + 2$ in ascending power of $(x + 2)$.

     (iv) (a)   Consider the sequence $< x_n >$ defined by $x_1 = \sqrt{2}, x_{n+1} = \sqrt{2 \cdot x_n} \;\; \forall n \geq 2$. Show that the sequence $< x_n >$ is convergent.

         (b)   Discuss the convergence of the series $\sum \dfrac{1}{n^P}, P \in \mathbb{R}$ for the case $p > 1$.

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F. Y. B. Sc. (Computer Science) Examination, October – 2012
ELECTRONICS
(Paper - I)
11311 – Electronic Devices, Circuits and
Computer Peripherals
(2008 Pattern)

Time : Three Hours   **Total Marks : 80**

Note :   (i)   *All questions are compulsory.*

(ii)   *Use of non-programmable electronic calculator is allowed.*

(iii)   *Draw neat diagrams wherever necessary.*

Q. 1. Attempt **all** of the following questions :   **[16]**

(a) Draw the circuit diagram of an optocoupler.

(b) Define transconductance and amplification factor in case of FET.

(c) Draw symbols for :

(i)   npn transistor

(ii)   pnp transistor

(d) State Kirchhoff's voltage law and Kirchhoff's current law.

(e) A two stage amplifier has the gains –

$Av_1 = 200$ and $Av_2 = 50$. Find the total gain in dB.

(f) IF $R = 4.7$ kΩ, $C = 0.1\mu$F for a phases shift oscillator, find frequency of output.

(g) State the full form of UPS and mention its types.

(h) State various components of a Pen Drive.

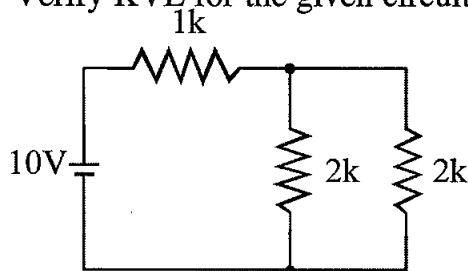**Q. 2.** Attempt **any four** of the following :   **[16]**

  (a) Explain the working principle of CCD.

  (b) Explain the working of n-channel JFET with circuit diagram.

  (c) Explain working of a Zener diode used as a voltage regulator.

  (d) Explain with proper circuit diagram the working of a Hartley
        Oscillator.

  (e) Write the principle of a photo-diode action with the circuit
        diagram.

  (f) Draw the circuit diagram of an Op-Amp used as an Integrator and
        derive the expression for its output.

Q. 3. Attempt **any four** of the following :   **[16]**

  (a) Explain the working of a npn transistor.

  (b) Explain how number $\exists$ can be displayed using a common anode
        seven segment display.

  (c) Verify KVL for the given circuit :
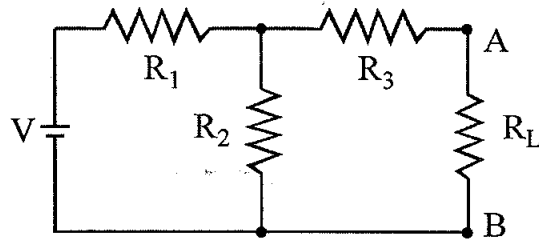

  (d) Mention the components of HDD and explain any two in brief.

  (e) Define any 4 parameters of an Op-Amp.

  (f) What is an oscillator? State any two types of oscillator and any
        two applications of an oscillator.

Q. 4. Attempt **any two** of the following :　　　　　　　　　　　　　[16]

(a) (i) Draw Thevenin's equivalent circuit for the given network.

(ii) Explain how transistor can be used as a switch.

(b) (i) Explain the application of a FET as VVR (voltage variable resistor).

(ii) Define CMRR, input impedance, output impedance and open loop gain of an Op-Amp.

(c) (i) Explain the classification of the amplifiers based on the frequency.

(ii) Explain the working principle of a keyboard.

(d) (i) Explain the circuit of a phase shift oscillator. Find f_0 if

$R = 64 \cdot 97 \, k\,\Omega, C = 0 \cdot 001 \, \mu f.$

(ii) Explain the working principle of E-only MOSFET.

Q. 5. Attempt **any one** of the following :　　　　　　　　　　　　　[16]

(a) (i) State the different types of motherboard. Mention different components on it. Explain any four in brief.

(ii) Identify the following Op-Amp circuits and find their output voltages.

(B)

(C)

(D)
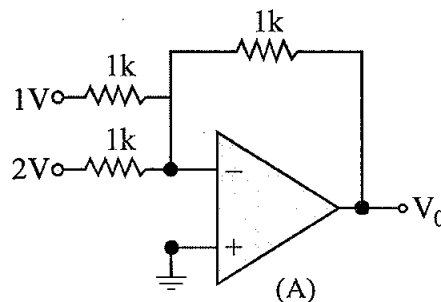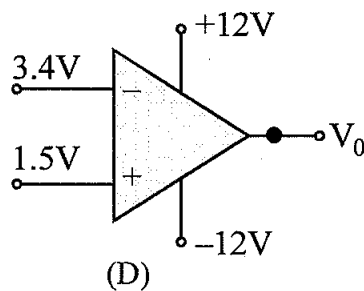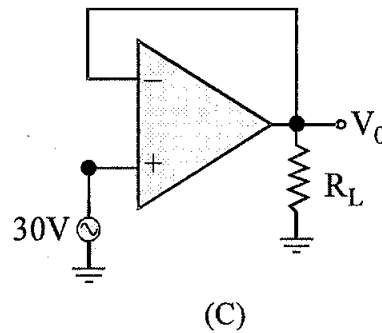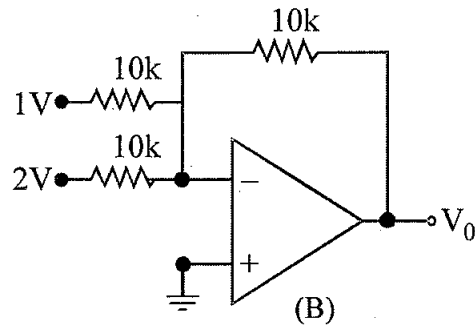
(b) (i)   Explain full wave rectifier with its circuit diagram and output waveforms. Compare half wave and full wave rectifiers.

   (ii)   (A) What is LCD? Explain in brief. What are advantages of LCDs over CRTs?

        (B) Explain different types of printers based on printer mechanism used and image formation technique used.

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F. Y. B. Sc. (Computer Science) Examination, October – 2012
ELECTRONICS
(Paper - II)
11312 – Fundamentals of Digital Electronics
(2008 Pattern)

Time : Three Hours   **Total Marks : 80**

Note :   *(i)*   *All questions are compulsory.*

        (ii)   *Use of non-programmable electronic calculator is allowed*

        (iii)   *Draw neat diagrams wherever necessary.*

Q. 1. Attempt **all** of the following questions :   **[8×2=16]**

    (a)   What is parity? What is the use of parity bit?

    (b)   State two de Morgan's theorems.

    (c)   Define modulo of a counter. Give number of flipflops required for MOD 5 counter.

    (d)   Write the formulae for output frequency and duty cycle for Astable multivibrator using IC 555.

    (e)   Write truth table of 1 : 2 demultiplexer.

    (f)   Give the full form of EPROM and EEPROM.

    (g)   For 4 bit R-2R type DAC with binary input 0101, find output voltage if $V_{ref} = 5V$.

    (h)   What is the use of Assembler?

Q. 2. Attempt **any four** of the following :   [4×4=16]

(a) Perform the following conversions :

(i) $(954 \cdot 61)_{10} = (?)_{BCD}$

(ii) $(153)_8 = (?)_{16}$

(iii) $(1011)_2 = (?)_{Gray}$

(iv) $(121)_{10} = (?)_{EXCESS\text{-}3}$

(b) Construct XOR gate using NOR gates only and justify.

(c) Simplify the following Boolean expression using k-map and draw its simplified logic diagram :

$$Y = \overline{A}BCD + A\overline{B}\,\overline{C}D + \overline{A}BC\overline{D} + ABCD + \overline{A}B\overline{C}\overline{D} + A\overline{B}\,\overline{C}\overline{D} +$$

$$A\overline{B}CD + A\overline{B}\,\overline{C}D$$

(d) Draw logic diagram of R-S flipflop using NAND gates and write its truth table. What is a function of clock input for clocked R-S flipflop.

(e) Draw circuit diagram of monostable multivibrator using IC 555. Give the formula to find pulse width. What do you mean by quasistable state?

(f) Compare RISC and CISC on the basis of addressing modes, instruction set, execution speed and memory references.

Q. 3. Attempt **any four** of the following :   [4×4=16]

    (a)   Draw the logic symbol of a tri-state buffer. What are the output states of tri-state buffer? Where the tri-state buffers are used?

    (b)   Give any four basic Boolean postulates and simplify the following expression using Boolean Algebra $A + \overline{A}B = A + B$.

    (c)   Draw and explain block diagram of 4 : 1 analog multiplexer.

    (d)   List two main features of Laptop and Desktop.

    (e)   Represent the following decimal numbers in 2's compliment format :

        (i) $(+19)_{10}$

        (ii) $(-25)_{10}$

    (f)   Draw block diagram and explain working of 2 bit parallel type ADC.

Q. 4. Attempt **any two** of the following :   [8×2=16]

    (a)   Draw circuit diagram of standard two input TTL NAND gate. Explain the function of multiemitter transistor. Define fan-in and fan-out of logic family.

    (b)   Define Encoder. With logic diagram explain octal to binary encoder. What is priority encoder?

    (c)   Configure IC 7495 as parallel in serial out shift register and explain it with the help of timing diagram.

(d) Do the following :

(i) $(11101 \cdot 011)_2 = (?)_{10}$

(ii) $(359)_{10} = (?)_8$

(iii) $(37 \cdot 12)_8 = (?)_2$

(iv) $(2AB)_{16} = (?)_2$

Q. 5. Attempt **any one** of the following :   [1×16=16]

(a) (i)   Differentiate between Half adder and Full adder. Add binary numbers $(10010)_2$ and $(10101)_2$. Implement parallel adder circuit for performing the above addition.

(ii) Draw and explain 3 bit Asynchronous up counter using timing diagram.

(b) (i)   Draw block diagram of IC 555 and explain the various blocks of it.

(ii) Design a memory with size 4k × 16 using chips of 4k × 4 and also design a memory with size of 4k × 16 using chips of 1k × 16.

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F. Y. B. Sc. (Computer Science) Examination, October – 2012

STATISTICS

(Paper - I)

11411 – Statistical Methods - I

(2008 Pattern)

Time : Three Hours

Total Marks : 80

Note : (i) *All questions are compulsory.*

(ii) *Figures to the right indicate full marks.*

(iii) *Use of single memory, non-programmable, scientific calculator and statistical tables is allowed.*

(iv) *Symbols have their usual meanings unless otherwise stated.*

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

[8×2=16]

(a) Define the following terms :

(i) Class boundaries

(ii) Class width

(b) For the following set of data, find mode and median :

10, 8, 6, 15, 10, 18, 12, 4, 7.

(c) In each of the following cases, state relationship between mean, median and mode :

(i) Symmetric distribution.

(ii) Positively skew distribution.

(d) What type of correlation do you expect in the following situations?

    (i)   Sale of ice-cream and day temperature.

    (ii)   Price of commodity and its demand.

(e) What is time series?

(f) Examine whether the results $r_{12} = 0.6$, $r_{23} = 0.4$, $r_{13} = -0.5$

    are consistent?

(g) State any two criteria for detecting lack of control of the process

    from control chart.

(h) Given the following information :

    $Q_1 = 13$, $Q_2 = 20$, $Q_3 = 30$.

    Calculate Bowley's coefficient of skewness.

Q. 2. Attempt **any four** of the following :   [4×4=16]

(a) State any four requisites of a good measure of central tendency.

(b) The following are the marks obtained by 40 students in a test :

    19, 50, 47, 34, 34, 19, 21, 24, 22, 23, 13, 37, 33, 36, 28, 33, 32, 26,

    28, 12, 37, 31, 41, 42, 38, 12, 22, 29, 15, 17, 15, 32, 21, 31, 48, 17,

    22, 49, 33, 28.

    Construct the stem and leaf chart.

(c)	Define median. State its formula for continuous frequency distribution and also state any two merits of it.

(d)	Given that, mean = 1, $\mu_2 = 3$ and $\mu_3 = 0$, obtain first three raw moments.

(e)	For the values 3, 5 and 7, weights assigned are as $(a-4)$, $(a-2)$ and $(a+1)$ respectively. If the weighted arithmetic mean is 6, find the value of 'a'.

(f)	If $n = 20$, $\Sigma X = 45$, $\Sigma X^2 = 118$, find standard deviation and coefficient of variation.

Q. 3. Attempt **any four** of the following :				[4×4=16]

(a)	Write a short note on Kurtosis.

(b)	Express first four central moments in terms of raw moments.

(c)	The standard deviation of a distribution is 5. If the distribution is mesokurtic, what will be the value of fourth central moment?

(d)	For the following data, calculate range and coefficient of range :

	4, 4, 12, 8, 9, 6, 12, 3, 6, 12, 15, 12.

(e)   From the following data :

	Factory A	Factory B
Number of Workers	350	380
Average daily wage (In ₹)	72.00	69.50

(i)   Which factory pays out larger amount as wage?

(ii)   Calculate combined wage of workers of the two factories taken together.

(f)   For a set of 20 observations the mean and variance are found to be 60 and 25 respectively. While checking it was found that one of the observation was wrongly taken as 10 instead of 8. Find correct mean and standard deviation.

Q. 4. Attempt **any four** of the following :   [4×4=16]

(a)   Define Karl Pearson's coefficient of correlation. Interpret the cases :

r = 0 and r = + 1.

(b)   Information on vehicles (in 'ooo) passing through seven different highways during a day (X) and the number of accidents reported (Y) is given as follows :

n = 7, $\Sigma X_i = 105$, $\Sigma Y_i = 509$, $\Sigma X_i^2 = 1681$, $\Sigma Y_i^2 = 39350$,

$\Sigma X_i Y_i = 8075$. Obtain the value of correlation coefficient between X and Y.

(c) Explain briefly the procedure of fitting the curve of the type

$Y = a + bX + cX^2$ to the bivariate data using the method of least

squares.

(d) The regression line of age in years (X) on height in feet (Y)

of male students is $X = 4Y + 5$. The regression line of Y on X

is $16Y = X + 64$. Find mean age and mean height of

the group. Also, estimate height of the boy whose age is

16 years.

(e) Define regression coefficients and state any two properties of

them.

(f) Following are the ranks in psychological test (X) and arithmetical

ability (Y).

Ranks of X	1	2	3	4	5	6
Ranks of Y	2	3	4	1	6	5

Calculate Spearman's rank correlation coefficient between

X and Y.

Q. 5. Attempt **any two** of the following :   [2×8=16]

   (a) (i) Explain the concept of trend in time series.

       (ii) Estimate the linear trend using centered moving average of period 4 for the following data :

Year	2001	2002	2003	2004	2005	2006	2007
Consumption	129	131	106	91	95	84	93

   (b) (i) State additive and multiplicative model of time series.

       (ii) Given the following information on a trivariate data

$$r_{12} = 0.5 \quad r_{13} = 0.6 \quad r_{23} = 0.7$$

obtain $r_{1.23}$ and $r_{12.3}$.

   (c) Let X_1 be yield of crop in quintals, X_2 be Spring rainfall in centimeters and X_3 be accumulated temperature about 5^0 C for a sample of 20 years showed the following results :

$$\overline{X}_1 = 28 \cdot 02 \quad \overline{X}_2 = 4 \cdot 91 \quad \overline{X}_3 = 5 \cdot 94$$
$$\sigma_1 = 4 \cdot 42 \quad \sigma_2 = 1 \cdot 10 \quad \sigma_3 = 85 \cdot 00$$
$$r_{12} = 0 \cdot 80 \quad r_{13} = 0 \cdot 40 \quad r_{23} = 0 \cdot 56$$

       (i) Obtain the equation of plane of regression of X_1 on X_2 and X_3.

       (ii) Estimate X_1 for $X_2 = 6.5$ cm and $X_3 = 6.0^\circ$C.

(d) The following table gives values of the mean and the range for 12 samples, each of size 5 taken from a certain production process at regular intervals :

Sample No.	1	2	3	4	5	6	7	8	9	10	11	12
Mean	23.2	25.7	24.9	24.3	25.1	22.9	26.1	27.9	24.7	22.8	22.6	28.5
Range	3.1	3.5	2.9	3.7	2.4	3.7	2.4	3.6	2.5	4.0	6.0	3.3

Examine whether the process is under statistical control using $\overline{X}$ and R charts.

(Given : n = 5, D_3 = 0, D_2 = 2.326, D_4 = 2.115, A_2 = 0.577)

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F. Y. B. Sc. (Computer Science) Examination, October – 2012
STATISTICS
(Paper - II)
11412 – Statistical Methods - II
(2008 Pattern)

Time : Three Hours   **Total Marks : 80**

Note :   *(i)*   *All questions are compulsory.*

      (ii)   *Figures to the right indicate full marks.*

      (iii) *Use of single memory, non-programmable, scientific calculator and statistical tables is allowed.*

      (iv)   *Symbols have their usual meanings unless otherwise stated.*

Q. 1. Attempt the following questions :   [8×2=16]

   (a) Define :

      (i)   Sample Space

      (ii) Mutually exclusive events

   (b) Give classical definition of Probability.

   (c) If $P(A) = \dfrac{1}{3}$, $P(B) = \dfrac{1}{4}$, $P(A \cap B) = \dfrac{1}{6}$, find $P(A \cup B)$.

(d)   State whether the following statements are True or False.

   (i)   For a discrete random variable (r. v.) X,

         $E[aX + b] = a E(X)$, where a and b being constants.

   (ii)   Variance of a random variable is never negative.

(e)   Let $X \rightarrow B(n, P)$

      If $P = \dfrac{1}{3}$, $E(X) = 4$, find n and var. (X).

(f)   State lack of memory property of an exponential distribution.

(g)   Let X be a continuous r. v. with probability density function

      (p. d. f.) given by

      $$f(x) = \begin{cases} c(3x^2 + 4), & 0 \leq x \leq 2 \\ 0 & , \text{ otherwise} \end{cases}$$

      find the value of c.

(h)   Explain the concept of null hypothesis.

Q. 2. Attempt **any four** of the following :   [4×4=16]

(a)   Define each of the following with one illustration :

   (i)   Non-deterministic experiments

   (ii)   Exhaustive events

(b)   In a random arrangement of all the letters of the word

"BACKLOG", find the probability that :

(i)   the two vowels come together.

(ii) the two vowels do not come together.

(c)   State :

(i)   Axioms of Probability

(ii) Bayes' Theorem

(d)   A r. v. X has the following probability distribution :

X :	0	1	2	3	4	5	6
P [X = x]	k	3k	5k	7k	9k	11k	13k

Find (i) The value of k,

(ii) $P(0 < X < 5 \,/\, X \geq 2)$

(e)   The number of people (X) entering the intensive care unit at a particular hospital on any one day has a Poisson distribution with mean equal to five persons per day. Find the probability that the number of people entering the intensive care unit on a particular day is :

(i)   exactly three

(ii) less than or equal to three.

(f) Define uniform distribution for a discrete r. v. X. State its mean and variance. Give one real life situation where it is applicable.

Q. 3. Attempt **any four** of the following :   **[4×4=16]**

(a) Four cards are drawn at random from a pack of 52 playing cards. Find the probability that :

     (i) two cards are red and two are black.

     (ii) they are a king, a queen, a jack and an ace.

(b) Define independence of two events. If A and B are two independent events defined on Ω, show that :

     (i) A and B$'$ are independent events.

     (ii) A$'$ and B are dependent.

(c) Let A, B and C be three mutually exclusive and exhaustive events defined on a sample space Ω.

     If $3P(A) = 2P(B) = P(C)$, find $P[A \cup B]$

(d) Define :

     (i) Probability mass function of a discrete r. v.

     (ii) Distribution function of a discrete r. v.

(e) The incidence of occupational disease in an industry is such that the workers have a 20% chance of suffering from it. What is the probability that out of six workers chosen at random, at least two will suffer from the disease?

(f) Define geometric distribution. State its mean and variance. Give one real life situation in which it can be used.

Q. 4. Attempt **any four** of the following :   **[4×4=16]**

(a) A r. v. X has the p.d.f. given by,

$$f(x) = \begin{cases} 1 & , 0 \leq x \leq 1 \\ 0 & , \text{otherwise} \end{cases}$$

Identify the distribution of r. v. X. Also, find

(i)   distribution function of r. v. X.

(ii) expectation of r. v. X.

(b) Define normal distribution. State any two properties of normal distribution.

(c) The heights of all cakes baked with a certain mix have an average of 5.4 cms with standard deviation 0.75 cm. Assuming that the distribution of heights is normal, find the percentage of cakes having the height between 5.0 cms and 6.1 cms.

(d) State the following :

(i)   Poisson approximation to binomial distribution.

(ii) Normal approximation to binomial distribution.

(e) The life time of a certain battery is a random variable which has an exponential distribution with mean 320 hours. Find the probability that such a battery will last :

(i)   at most 260 hours.

(ii) between 540 and 860 hours.

(f) Explain the concept of the following terms :

(i)   Statistic

(ii) Critical region

Q. 5. Attempt **any two** of the following :   [2×8=16]

(a) (i) Describe test procedure for testing hypothesis $H_0 : P = P_0$ against $H_1 : P \neq P_0$ for a large sample at α % level of significance.

(ii) When operating properly, a machine will produce items which measures 2 cm in diameter with standard deviation of 0.05 cm. A sample of 49 items produced by that machine gives the average diameter of 1.98 cm. Test at 1% level of significance whether the machine is operating properly.

(b) (i) Explain the procedure of obtaining a model sample from an exponential distribution with mean θ.

(ii) A survey was conducted to investigate whether alcohol drinking and smoking are related. The following information was compiled for 600 persons.

	Smoker	Non-Smoker
Drinker	193	165
Non - drinker	89	153

Test the hypothesis that alcohol drinking and smoking are not related at 5% level of significance.

(c) (i) Describe test procedure for testing $H_0 : \mu_1 = \mu_2$ against $H_1 : \mu_1 \neq \mu_2$, at α % level of significance for a small sample.

(ii) The following arrangement indicates whether 30 consecutive cars which went by the toll booth of a bridge had local plates L or out of state plates O :

LL O LLLL OO LLLL O L OO LLLL O L OO LLL OO

Test at 5% level of significance whether this arrangement of L's and O's may be regarded as random.

(d) (i) 60 children were asked which flavour of ice-cream they liked out of Vanilla. Pista and Butter-Scotch.

The answers recorded are as follows :

Flavour	Number
Vanilla	17
Pista	24
Butter-Scotch	19

Test if there is any difference among the tastes of the children as far as ice-cream flavours are concerned at 5% level of significance.

(ii) Explain how sign test can be used in testing symmetry of the sample.

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