[3818]-1

F. Y. B. Sc. (Computer Science) Examination - 2010
COMPUTER SCIENCE
PAPER - I
INTRODUCTION TO PROGRAMMING AND 'C' PROGRAMMING
(June 2008 Pattern)

Time : 3 Hours]   **[Max. Marks : 80**

Instructions :

       (1) All questions are compulsory.

       (2) Figures to the right indicate full marks.

       (3) Neat diagrams must be drawn wherever necessary.

Q.1) Answer the following : **(Any Ten)**   **[1x10=10]**

   (1)   What is Comment ? How it is given in 'C'.

   (2)   What is the purpose of exit( ) function ?

   (3)   What is Masking ?

   (4)   When was 'C' developed and by whom ?

   (5)   Write syntax of fwrite( ) function.

   (6)   Find memory requirement for

       union t1

       { char S[5];

          int num;

       };

   (7)   Compare the following statements :

       (a)   # include <x.h>

       (b)   # include "x.h"

   (8)   What is Literal ?

   (9)   Find value of res, where n = 1, res = n<<2

   (10) What is the use of typedef keyword ?

(11) Explain use of fflush( ) function with its syntax.

(12) Find k, if int j = 6 ; k = (j == 5);

Q.2) Answer the following : **(Any Four)**   **[5x4=20]**

   (a)   Differentiate between Text and Binary Files.

   (b)   What do you mean by array of pointers and pointer to array ? Explain with example.

   (c)   Explain various storage classes used in 'C'.

   (d)   Explain Break and Continue Statements with proper example.

   (e)   Discuss various forms of Increment and Decrement Operators with example.

Q.3) Answer the following : **(Any Four)**   **[5x4=20]**

   (a)   Define Flowchart. Explain various symbols used for drawing flowchart with their usage.

   (b)   Find and justify output of the following program segment :

```
# include <stdio.h>
int f (char * p);
main( )
{
   char str[ ] = "ANSI";
   printf("%d", f(str));
}
   int f(char * p)
{
   char * q = p;
   while (* ++p);
   return (p – q);
}
```

(c) Find and justify output of the following program segment :

```
# include <stdio.h>
main( )
{
    char string[ ] = "Hello World";
    int m;
    for (m = 0; string [m]; = '\0', m++)
        if ((m % 2) == 0)
            printf("%c", string [m]);
}
```

(d) Find and justify output of the following program segment :

```
main( )
{
    int i = 12345;
    float res;
    res = i/100;
    printf("% 3.2 f", res);
    res = (float i)/100;
    printf("% 3.2f ", res);
}
```

(e) Consider the following program segment :

```
struct abc
{
    int a ; float b;};
    struct xyz
{
    int x; float y;};
structabc a1, a2;
structxyz x1, x2;
```

(f)   Find errors, if any, in the following statements, give proper explanation :

   (i)   a1 = x1;

   (ii) abc.a1 = 10.75;

   (iii) int m = a + x;

   (iv) int n = x1.x + 10;

   (v)   a1 = a2;

Q.4) Answer the following : **(Any Four)**   **[5x4=20]**

   (a)   Write a program to display first 5 perfect numbers.

   (b)   Write a 'C' program for finding GCD of 2 numbers using recursion.

   (c)   Write a program to accept m × n matrix and generate m + 1 × n + 1 matrix such that the mth row contains sum of elements of corresponding columns and nth column contains sum of elements of corresponding rows.

   (d)   Write a program in 'C' for finding largest of 2 numbers using a macro.

   (e)   Write a 'C' program for accepting 2 numbers as command line argument and find sum and difference of these numbers.

Q.5) Answer the following : **(Any Two)**   **[5x2=10]**

   (a)   Write short note on Computer Languages.

   (b)   Explain various qualifiers which can be used with int data type.

   (c)   What is Array ? What are the limitations of Array ? Explain different types of arrays with example.

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F. Y. B. Sc. (Computer Science) Examination - 2010
COMPUTER SCIENCE
PAPER - II
FILE ORGANISATION AND FUNDAMENTALS OF DATABASE
(June 2008 Pattern)

Time : 3 Hours]　　　　　　　　　　　　　　[Max. Marks : 80

Instructions :

　　　(1)　*All questions are compulsory.*

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

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

Q.1) Answer the following : **(Any Ten)**　　　　　**[1x10=10]**

　　(1)　Define Third Normal Form.

　　(2)　What is an Attribute ?

　　(3)　Explain Project Operation.

　　(4)　Discuss use of 'having' clause.

　　(5)　What is Functional Dependencies ?

　　(6)　What is Pile File ?

　　(7)　Define order of 'B$^+$' Tree.

　　(8)　Define any two advantages of DBMS over File System.

　　(9)　What is Foreign Key ?

　　(10)　Define Variable Length Record.

　　(11)　What is Logical File ?

　　(12)　State any one rule to convert E-R diagram into tables.

Q.2) Answer the following : **(Any Four)**   **[5x4=20]**

   (a)   Differentiate between Dense and Sparse Index.

   (b)   Write a note on Data Abstraction.

   (c)   What are the different types of Attributes ?

   (d)   What are Integrity Constraints ? How are they classified ?

   (e)   Consider relation :

         R = (A, B, C, D, G, H, I) and set of functional dependencies defined on R, f as.

         f = {A → B, A → B, A → C, CG → H, CG → I, B → H}.

         Find all Super Keys and Primary Keys for relation R.

Q.3) Answer the following : **(Any Four)**   **[5x4=20]**

   (a)   Explain different types of Database Users.

   (b)   State different types of relationships that can exist between entity sets in an E-R Model.

   (c)   Explain Loss-less Decomposition with example.

   (d)   What are the undesirable properties of Bad Database Design ?

   (e)   Discuss Memory Hierarchy with diagram.

Q.4) **(A)** Answer the following : **(Any Three)**   **[5x3=15]**

   (a)   Consider the following relation :

         Customer(cid, cname, caddress, city, state)

         Order(oid, odate, oamount)

         Customer and Order are related with one-to-many relationship.

         Create a Relational Database for the above and convert it in 3NF and solve the following queries in SQL :

         (i)   List names of customers who belong to Maharashtra State, sorted on city.

         (ii) What are the names of all customers who placed orders between 01-01-2008 to 31-01-2008 ?

         (iii) List names of the customer who gave maximum orders in the month of March.

(b) Consider the following relation :

Doctor (dno, dname, address, city)

Patient (opdno, pat-name, address, disease)

Doctor and Patient are related with many-to-many relationship.

Create a Relational Database for the above and convert it in 3NF and solve the following queries in SQL :

(i) Find no. of patients visited by "Dr. Pawar".

(ii) Find no. of patients suffering from "Asthma".

(iii) Delete all patient's record suffering from "Viral Fever".

(c) Consider the following relation :

Machine (mno, mname, mtype, mcost)

Part (pno, pname, pdese)

Machine and Part are related with one-to-many relationship.

Create a Relational Database for the above and convert it in 3NF and solve the following queries in SQL :

(i) Increase Cost of Machine by 10%.

(ii) Delete all machines having part "Oil Tank".

(iii) List all parts of machines whose cost > 1,00,000.

(d) Consider the following relation :

Company (cid, cproduct, cname, region, state)

Dealer (dno, dname, daddress, dcity)

Company and Dealer are related with many-to-many relationship.

Create a Relational Database for the above and convert it in 3NF and solve the following queries in SQL :

(i) List Dealer of Company "HCL".

(ii) Count number of Dealers from city "Mumbai".

(iii) Delete record of Dealer whose Dealership by "HP".

(B)   Answer the following : **(Any One)**   [5x1=05]

    (a)   Consider the following relationships :

        Item (item_code, item_name, price)

        Order (order_code, date, customer_name)

        Item_Order (item_code, order_code, quantity)

        Solve queries in Relational Algebra :

        (i)   Find all the items that are ordered by customers.

        (ii)   Find all the order numbers alongwith different items and respective items under them.

        (iii)   List all the orders before 9th December, 2009.

        (iv)   List all the items alongwith their prices.

        (v)   Find most costly item.

    (b)   Consider the following relationship :

        Player (pno, name, city)

        Game (gno, name, city)

        Player Game (pno, gno, date)

        Solve queries in Relational Algebra :

        (i)   Find list of players playing "Boxing".

        (ii)   Find list of games played by more than 10 players.

        (iii)   Find list of players and games played on 28 February, 2009.

        (iv)   List all available games in India.

        (v)   List players playing Cricket and Football.

Q.5) (A) Shubhangi Yoga Exercise Center having two receptionists who take care that every person who comes in exercise center giving the fees or not ? There are many gents, ladies and children who come to do exercise. The center provides gym, aerobics, swimming, tennis, chess and yoga.

Each section has different well trained coach.

There is Management Committee to manage all the outside things like marketing, government permission, taxes etc.

Suggest a suitable Information System to handle the above tasks :

(i) Draw Entity_Relation Diagram for the Information System Design.

(ii) Convert Entity_Relation Diagram Relational Database in 3NF. **[07]**

(B) What are the Key Constraints ? Explain Primary Key. **[03]**

OR

(B) Explain Degree of Relationship Type. **[03]**

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F. Y. B. Sc. (Computer Science) Examination - 2010
MATHEMATICS
PAPER - I
DISCRETE MATHEMATICS
(June 2008 Pattern)

Time : 3 Hours]   **[Max. Marks : 80**

Instructions :

    (1) All questions are compulsory.

    (2) Figures to the right indicate full marks.

    (3) Neat diagrams must be drawn wherever necessary.

Q.1) Attempt **each** of the following :   **[16]**

  (a)   State Second Principle of Mathematical Induction.

  (b)   In how many ways can 4 identical red pens, 6 identical green pens and 3 identical blue pens be arranged ?

  (c)   Translate the following into Symbolic Form. Hence, write its negation :

       "There exists a natural number x such that $x^2 + 1 = 0$".

  (d)   Solve recurrence relation

       $a_n - a_{n-2} = 0$

  (e)   Determine minimum number of vertices in a simple graph with 30 edges.

  (f)   Find number of components in the following graph :
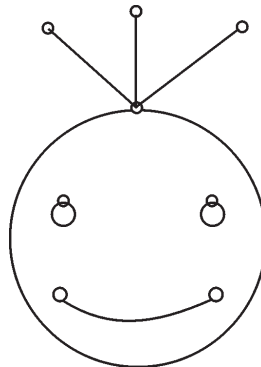
(g) State true or false with justification :

"A binary tree with n vertices has $\left(\dfrac{n-1}{2}\right)$ non-pendant vertices."

(h) Define :

(i) Strongly Connected Diagraph

(ii) Edge Connectivity of a Graph

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

(a) Write an algorithm to solve homogeneous linear recurrence relation of order k with constant coefficients.

(b) Find number of integers between 1 and 1,000 which are not divisible by any of 2, 3 and 7.

(c) Prove by induction that :

$2^n > 2n + 1$, for n   3

(d) Prove validity of the following argument by using method of indirect proof :

$p \vee \sim q, r \rightarrow \sim q, q \vdash \sim r$

(e) Write an algorithm to sort an array by using bubble sort.

(f) Given a group of n women and their husbands, how many people must be chosen from this group to guarantee that the set contains married couple ?
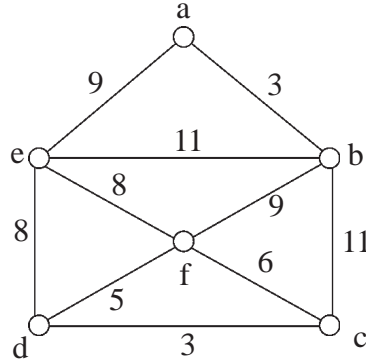
Q.3) Attempt **any four** of the following : [16]

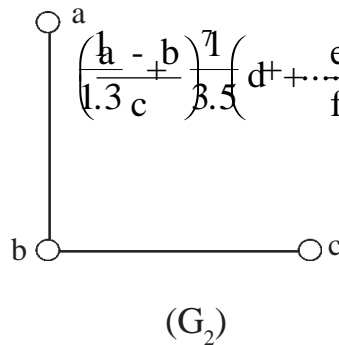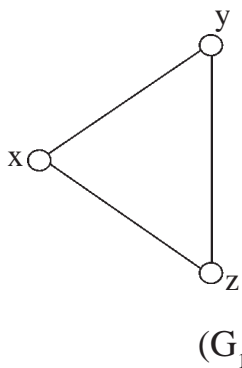(a) Write adjacency matrix and incidence matrix of the following graph :
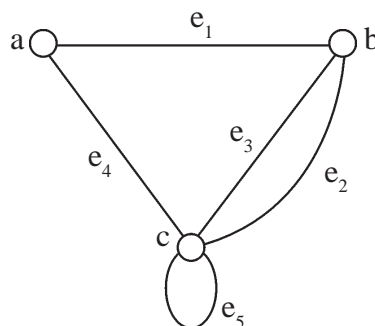
(b) Draw any four non-isomorphic spanning subgraphs of the graph k_4.

(c) Prove that there is one and only one path between any two vertices in a tree.

(d) Using Kruskal's Algorithm, find shortest spanning tree of the following graph. Also find weight of the shortest spanning tree.

(e) For the following expression draw arborescence and write expression in Polish notation :

(f) Find $G_1 \quad G_2$, where

$$\left(\frac{a\ -\ b}{1.3}+\frac{1}{c}\right)\left(\frac{1}{3.5}\left(d++..\frac{e}{f}\right)^2\right)+\frac{1}{2n\ -\ 1}\ \ \frac{1}{2n\ +\ 1}=\frac{n}{2n\ +\ 1}$$

(G_1) (G_2)

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

(a) Solve recurrence relation :

$a_n - 9a_{n-1} + 20\ a_{n-2} = 2.5^n,\ a_0 = 0,\ a_1 = 1$

(b) (i) Test validity of the following argument :

R → P, G → M, P M → S, ~S ⊢ ~(R G)

(ii) Prove by induction that :

,

for n   1.

(c) (i) How many numbers are there between 100 and 1000 in which all the digits are distinct ?

(ii) Sort the following array by insertion method :

9, 7, 5, 3, 1, 8, 5, 4, 10

(d) (i) If V = {0, 1, 2}, find truth values of the following :

(1) (x) $(x^2$ $10)$

(2) x $(x^2 - 3x + 2 = 0)$

(ii) A college has 19,000 students with more first year students than second year or third year or fourth year students. What is the minimum number of first year students the college can have ?

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

(a) Let G be a connected graph. A vertex V of G is a cutvertex if and only if there are two vertices u and w in G, both distinct from V, such that V lies on every u – w path of G.

(b) Using Dijkstra's Algorithm, determine shortest path from the vertex a to the vertex f in the following graph :
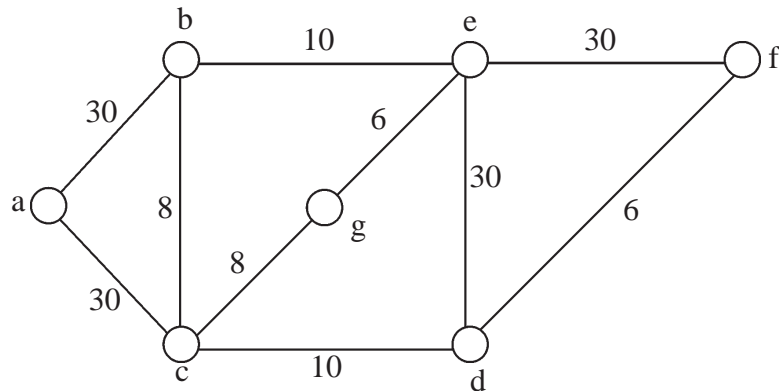
(c) Determine maximal flow in the following network by using Ford-Fulkerson Algorithm :
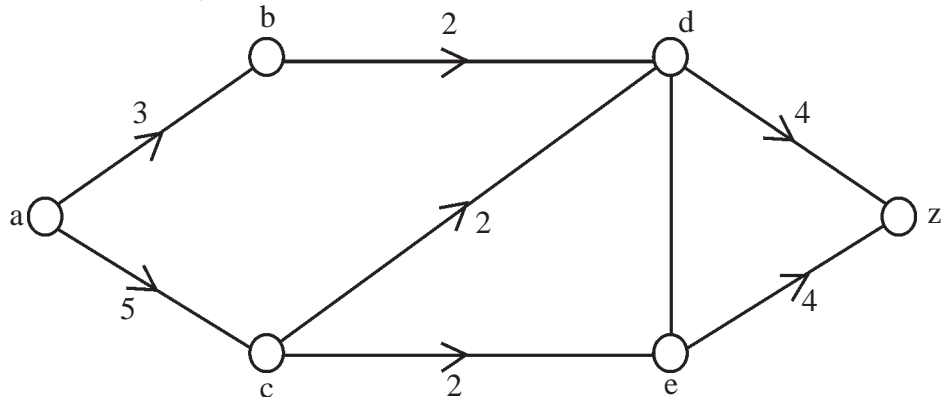
(d) (i) Find all fundamental circuits for the graph G with respect to the spanning tree T :
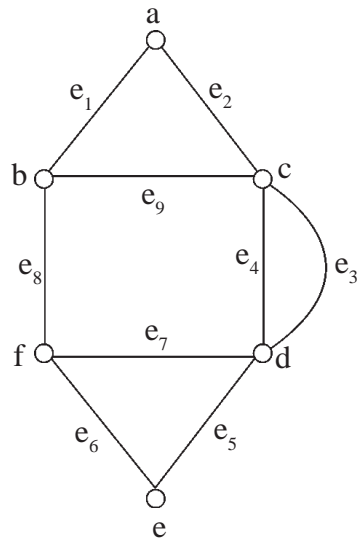
(G)   (T)

(ii) Determine minimum and maximum height of a binary tree with 31 vertices.

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F. Y. B. Sc. (Computer Science) Examination - 2010

MATHEMATICS

PAPER - II

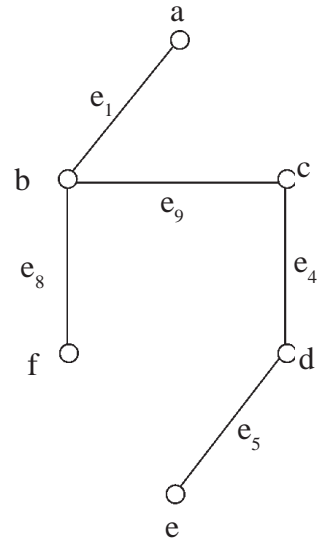### ALGEBRA AND CALCULUS

(June 2008 Pattern)

Time : 3 Hours]   **[Max. Marks : 80**

Instructions :

        (1) All questions are compulsory.

        (2) Figures to the right indicate full marks.

        (3) Neat diagrams must be drawn wherever necessary.

Q.1) Attempt **each** of the following :   **[16]**

    (a)   Let $A = \{a, b, c, d\}$ and R be a relation defined on A, such that

            $R = \{(a, a), (b, b), (c, c), (d, d)\}$

            Is R symmetric, transitive ?

    (b)   List all the elements in Z_6 which satisfy $x^2 = x$.

    (c)   Is the lattice D_8 with the partial order relation 'divides' complemented ?

    (d)   Prove that $19/(2^{18} - 1)$.

    (e)   Assuming Cauchy's Mean Value Theorem is applicable for functions $f(x) = e^x$ and $g(x) = e^{-x}$ on [a, b], show that 'c' is the arithmetic mean between a and b.

    (f)   Evaluate $\displaystyle\lim_{x \to 0} \frac{a^x - 1}{b^x - 1}$.

(g) If $f(x) = 2 + \dfrac{x^2}{2} + \dfrac{x^3}{3} + \dfrac{3x^5}{40} + \ldots\ldots,$

then find $f^{(v)}(0)$.

(h) Test convergence of the sequence $\{x_n\}$, where $x_n = (-1)^n$, $n \in \mathbb{N}$,

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

(a) Draw diagraph of the relation R given by aRb iff $a + b \leq 5$, a, b $\in A$ where A = $\{1, 2, 3, 4, 8\}$. Also find M(R).

(b) Let relation R on the set of integers defined as xRy if and only if $3x + 4y$ is divisible by 7, x, y$\in\mathbb{Z}$. Show that R is an equivalence relation.

(c) Let n$\in$N and a, b, c $\in \mathbb{Z}$. If ac $\equiv$ bc (mod n) and (c, n) = d where ṅ = dw, w$\in\mathbb{Z}$, then prove that a $\equiv$ b (mod w).

(d) Find remainder when $5^{2009} + 185$ is divided by 11.

(e) Let A = $\{a, b\}$ be a set. Show that (P(A), $\underline{C}$) is a Boolean Algebra. Also find atoms in P(A).

(f) Let L be a complemented lattice and a, b $\in$ L. Then show that

(i) $\overline{a \vee b} = \bar{a} \wedge \bar{b}$

(ii) $a \vee (a \wedge b) = a$

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

(a) Show that the sequence $\{x_n\}$ defined by $x_1 = 1$ and $x_{n+1} = \dfrac{2x_n + 3}{4}$, n $\geq$ 1 is convergent. Also find its limit.

(b) Discuss convergence of the series $\sum \left(\sqrt{n+1} - \sqrt{n}\right)$.

(c) State and prove Rolle's Mean Value Theorem.

(d) Discuss continuity of the function f(x) defined as :

$$f(x) = \begin{cases} x & \text{if } 0 \leq x < \tfrac{1}{2} \\ 1 - x & \text{if } \tfrac{1}{2} \leq x < 1 \\ x^2 & \text{if } 1 \leq x < 2 \end{cases}$$

(e) Find n^{th} derivative of y, where $y = \dfrac{1}{x^2 - 5x + 6}$.

(f) Evaluate the limit

$$\lim_{x \to 0} \dfrac{e^x - e^{-x} - 2\log(1 + x)}{x \sin x}$$

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

(a) Let A = {a, b, c, d} be any set and R be a relation defined on A such that

R = {(a, a), (a, c), (b, c), (c, c), (a, d), (d, b), (c, a), (d, d)}

Find transitive closure of R by using Warshall's Algorithm.

(b) Find greatest common divisor α of 3997 and 2947 using Euclidean Algorithm. Also find integers x and y such that
d = 3997x + 2947y.

(c) Let ~ be an equivalence relation on a non-empty set A. Then prove that :

(i) $a \in [a] \; \forall \; a \in A$

(ii) $a \in [b]$ if and only if $[a] = [b]$ for any a, b ∈ A.

(iii) Any two equivalence classes are either disjoint or identical.

(d) Find disjunctive normal form of the function

$f(x, y, z) = (x \vee y) \vee \left[\overline{(\bar{x} \vee y \vee z)}\right].$

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

(a) State and prove Lebnitz Theorem. Hence find y_n for $y = x^2 \cos (2x - 3)$.

(b) (i) Verify Lagrange's Mean Value Theorem for the function
$f(x) = \sin x + \cos x$ on $\left(0, \dfrac{\pi}{2}\right)$.

(ii) Test convergence of the series $\sum \dfrac{2^{n-1}}{n.3^m}$

(c) Prove that the sequence $\{x_n\}$ where $x_n = \left(1 + \dfrac{1}{n}\right)^n$, $n \in \mathbb{N}$ is convergent. Also find limit of the sequence.

(d) Assuming validity of the expansion, expand $\log \sqrt{\dfrac{1 + x}{1 - x}}$.

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F. Y. B. Sc. (Computer Science) Examination - 2010
ELECTRONICS

PAPER - I

ELECTRONIC DEVICES, CIRCUITS AND COMPUTER PERIPHERALS

(June 2008 Pattern)

Time : 3 Hours]   **[Max. Marks : 80**

Instructions :

(1) All questions are compulsory.

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

(3) Draw neat diagram wherever necessary.

Q.1) Attempt **all** of the following :   **[8x2=16]**

(a)   Give statements of KVL and KCL.

(b)   Draw symbols of :

(i)   LED

(ii) Photodiode

(iii) Zener Diode

(iv) Rectifierdiode

(c)   State different BJT Configurations. Which one of them is widely used as amplifier.

(d)   Define the terms w.r.t. FET :

(i)   Transconductance

(ii) Amplification Factor

(e)
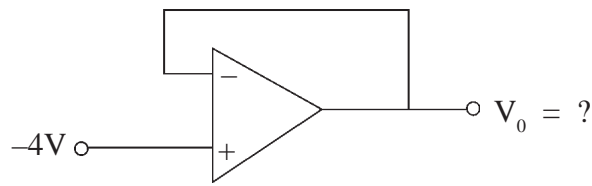
Identify Configuration of Op-Amp and find Output Voltage.

(f)   In an Hartley Oscillator if $L_1 = L_2 = 1mH$ and C = 0.01   F; find frequency of Oscillation.

(g)   Define the terms w.r.t. Power Supply :

(i)   Load Regulation

(ii)   Line Regulation

(h)   List any four Input Devices of Computer.

Q.2) Attempt **any four** of the following :   **[4x4=16]**

(a)   Explain operating principle of LED. State its any two applications.

(b)   Explain MOSFET as an Inverter.

(c)   Draw circuit diagram of non-inverting Op-Amp. Derive an expression for its Output Voltage.

(d)   With neat circuit diagram and waveforms explain working of half wave rectifier.

(e)   Explain operating principle of Inkjet Printer.

(f)   Explain, how a transistor is used to switch LED ?

Q.3) Attempt **any four** of the following :   **[4x4=16]**

(a)   (i)   Give statement of Superposition Theorem.

(ii)   Find voltage across each resistor in the following circuit :
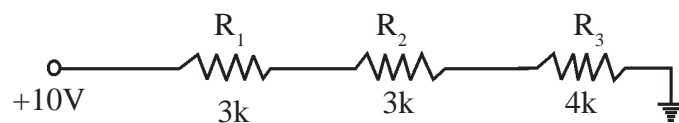
(b) Define the following parameters of Op-Amp :

    (i)   Input Offset Current

    (ii) Input Impedance

    (iii) Output Impedance

    (iv) Open Loop Gain

(c) Explain action of forward biased P-N Junction Diode.

(d) Explain how Zener Diode can be used as Voltage Regulator ?

(e) Explain Electronics in Pen Drive.

(f) Draw circuit diagram of Phase Shift Oscillator and explain its working. Write an expression for Output Frequeney.

Q.4) Answer **any two** of the following :   **[2x8=16]**

(a) Explain electronics in following devices :

    (i)   Joy Stick

    (ii) Light Pen

(b) (i)   Explain concept of CVT (Constant Voltage Transformer) with proper diagram.

    (ii) Draw block diagram of Off-line UPS and state its two applications.

(c) Explain classification of transistor amplifier based on :

    (i)   Frequency Response

    (ii) Position of Q Point

(d) Draw circuit diagram for potential divider bias and derive expression for $I_{c(sat)}$ and $V_{CE(cutoff)}$. What do you mean by D.C. Load Line ? State its importance.

Q.5) Attempt **any one** of the following :   **[1x16=16]**

  (a)   (i)   Explain working principle of MOSFET in –

          (1)   Depletion Mode

          (2)   Enhancement Mode

     (ii)   Find Thevenin's and Norton's Equivalent Circuit for the following circuit :
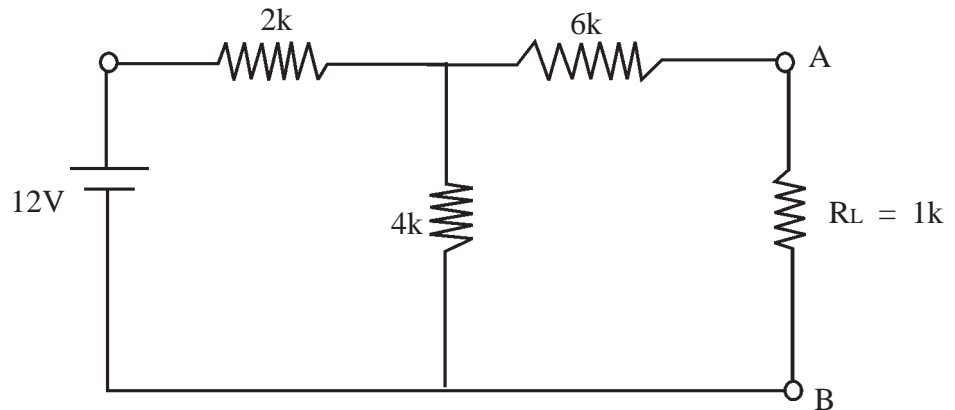
  (b)   (i)   (1)   Explain different components of Hard Disk Drive.

          (2)   State any four components of Mother Board.

     (ii)   (1)   Draw circuit diagram of Op-Amp integrator and derive an expression for output voltage.

          (2)   Identify Configurations of Op-Amp and find voltages at point C.
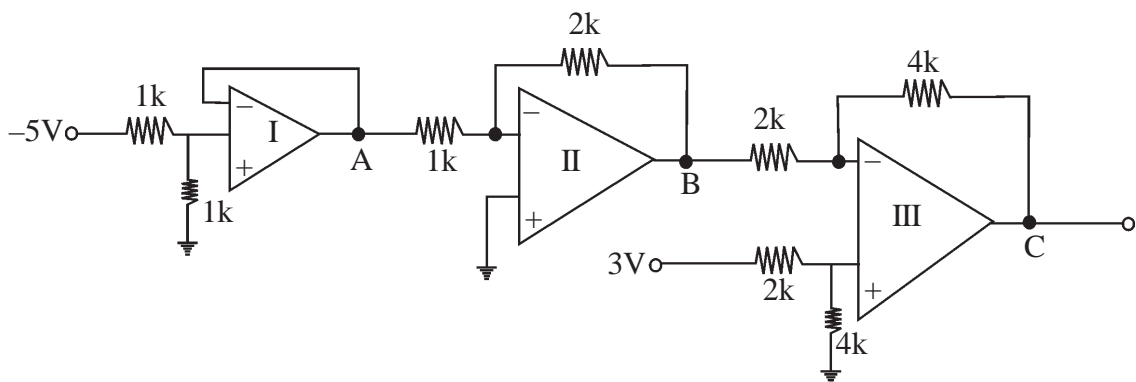
Total No. of Questions : 5]   [Total No. of Printed Pages : 3

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F. Y. B. Sc. (Computer Science) Examination - 2010

ELECTRONICS

PAPER - II

FUNDAMENTALS OF DIGITAL ELECTRONICS

(June 2008 Pattern)

Time : 3 Hours]   [Max. Marks : 80

Instructions :

      (1) All questions are compulsory.

      (2) Use of non-programmable calculator is allowed.

      (3) Draw neat diagram wherever necessary.

Q.1) Attempt **all** of the following :   [2x8=16]

    (a)   List different number systems. Give base (radix) of each.

    (b)   Draw symbol for two input OR, AND Gate. Give truth table for each.

    (c)   Draw logic diagram for Half Adder.

    (d)   What is Mod-10 Counter ? Give an IC number for Decade Counter.

    (e)   What is Quasi-stable State ?

    (f)   Differentiate between Volatile and Non-volatile Memory.

    (g)   Give any two disadvantages of Binary Weighted Resistor DAC.

    (h)   Differentiate between Interpreter and Compiler.

Q.2) Attempt **any four** of the following :   **[4x4=16]**

    (a)   Perform the following conversions :

        (i) $(19.25.)_{10} = (?)_8$

        (ii) $(10110)_2 = (?)_{gray}$

        (iii) $(2F9A)_{16} = (?)_2$

    (b)   Write notes on :

        (i)   Supercomputers

        (ii)   Servers

    (c)   Explain Nibble Adder with neat diagram.

    (d)   Draw block diagram of 3-bit Asynchronous up counter and its timming diagram.

    (e)   Explain working principle of PROM.

    (f)   Solve R-2R Ladder Resistive Network (DAC) using Thevenin's Theorem for given input digital data $(0010)_2$. $V_R = 5V$.

Q.3) Attempt **any four** of the following :   **[4x4=16]**

    (a)   Explain in brief ARM and PIC Micro-controllers.

    (b)   Differentiate between SRAM and DRAM.

    (c)   Draw neat, labelled internal block diagram of IC555.

    (d)   Minimize the following Boolean Expression using K-map. Realize reduced expression using logic gates.

        $y = \Sigma m\ (1,\ 3,\ 7,\ 11,\ 15) + d\ (0,\ 2,\ 5)$

    (e)   Draw T and D Flip-Flops using NAND Gates. Write truth table of each.

    (f)   Explain 4 : 1 multiplexer using basic gates. What is the function of strobe input ?

Q.4) Attempt **any two** of the following :   **[8x2=16]**

   (a)   Explain working of 3-bit Flash ADC. Give its advantages and disadvantages.

   (b)   Perform the following operations :

      (i) $(48)_{10} - (23)_{10}$ using 1's complement

      (ii) $(11001)_2 - (10011)_2$ using 1's complement

      (iii) $(1111)_2$ $(0010)_2$

      (iv) $(3F)_{16} - (5C)_{16}$ using 2's complement

   (c)   Explain in brief ASIC, CISC, RISC, SIMD.

   (d)   (i)   Explain noise immunity of TTL Gates.

      (ii)   Design basic logic gates using NAND Gate.

Q.5) Attempt **any one** of the following :   **[16x1=16]**

   (a)   (i)   Explain Octal to Binary Encoder using logic gates.   **[08]**

      (ii)   Explain operation of Bi-stable Multivibrator.   **[04]**

      (iii)   Calculate output frequency of an Astable Multivibrator with R_A = 4.7 kΩ and R_B = 10kΩ, C = 0.01μF.   **[04]**

   (b)   (i)   Explain any two modes of 4-bit Shift Register.   **[08]**

      (ii)   Design 64k byte RAM Memory using available Memory Chip 16k   8 RAM.   **[08]**

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Total No. of Questions : 5]   **[Total No. of Printed Pages : 5**

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F. Y. B. Sc. (Computer Science) Examination - 2010
STATISTICS
PAPER - I
STATISTICAL METHODS - I
(New 2008 Pattern)

Time : 3 Hours]   **[Max. Marks : 80**

Instructions :

     (1) All questions are compulsory.

     (2) Figures to the right indicate full marks.

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

     (4) Symbols have their usual meanings unless otherwise stated.

Q.1) Attempt **each** of the following :   **[8x2=16]**

   (a)   Define the terms Frequency and Cumulative Frequency.

   (b)   For the following Set of Data, find values of Mean and Variance :

       7, 7, 7, 7, 7, 7, 7.

   (c)   Define Partition Values.

   (d)   In a batch of 10 students, 3 failed in a certain examination. The marks obtained by 7 passed students were 70, 80, 44, 55, 80, 75, 55. Find median of marks obtained by all 10 students.

   (e)   State any two properties of Regression Coefficients.

   (f)   Comment on the following for a Bivariate Data,

       $r_{xy} = 0.9$, $b_{xy} = 2.04$, $b_{yx} = -3.2$.

(g)   Write any two Utilities of Time Series.

(h)   Calculate $r_{23.1}$ if

$r_{12} = 0.59$, $r_{13} = 0.46$, $r_{23} = 0.77$.

Q.2) Attempt **any four** of the following :   **[4x4=16]**

(a)   Define each of the following with the help of an example :

(i)   Class Width

(ii)   Frequency Density

(iii) Raw Data

(iv) Weighted Arithmetic Mean

(b)   The mean weekly expenditure on petrol of 50 persons was calculated as Rs. 116. It was later discovered that one observation was misread as Rs. 163 instead of Rs. 136. Calculate correct average expenditure on petrol.

(c)   State merits and demerits of Median.

(d)   The daily expenditure of 100 families is given below. If the mode of distribution is 43.5, find missing frequencies :

Expenditure	20-29	30-39	40-49	50-59	60-69
No. of Families	14	–	27	–	15

(e)   What are Lower Quartile and Upper Quartile of a Frequency Distribution ? Explain method of locating lower quartile from less than ogive curve.

(f)   Consider the following data :

	Factory A	Factory B
No. of Employees	350	380
Mean Daily Wages	Rs. 72	Rs. 69.50

Calculate :

(i)   Which factory pays higher amount of wages ?

(ii)   Combined wages of the two factories together.

Q.3) Attempt **any four** of the following : [4x4=16]

    (a)   Define the term Variance of a Data Set. State effect of change of origin and scale on the variance.

    (b)   The data of runs scored by players A and B in 5 test matches are shown below :

	Player A	Player B
Average	53	45
Standard Deviation	40	16

        Examine :

        (i)   Which player is more consistent ?

        (ii)   Which player is better in batting average ?

    (c)   Explain concepts of Skewness and Kurtosis of a Data Set. State one measure each for Skewness and Kurtosis.

    (d)   For a moderately skewed distribution Mean is 29.6 and Standard Deviation is 6.5 and $(Sk)_p$ is 0.32. Find Mode and Median.

    (e)   What are raw and central moments of a data set ?

    (f)   Find the 6th decile for the following frequency distribution :

Donation in (Rs.)	Below 500	500-600	600-700	700-800	800-900	900 and above
No. of Persons	12	20	44	26	18	10

Q.4) Attempt **any two** of the following : [2x8=16]

    (a)   (i)   Write a short note on Scatter Diagram. Draw sketches of scatter diagram to show Perfect Positive Correlation and High Negative Correlation.

        (ii) $n = 20$, $\Sigma x = 80$, $\Sigma y = 40$,

                  $\Sigma x^2 = 1680$, $\Sigma y^2 = 320$, $\Sigma xy = 480$

            Obtain value of correlation coefficient and comment upon it. Also, find equation of Line of Regression X on Y.

(b) (i) Write stepwise procedure of fitting the curve $y = ab^x$ using least square principle.

(ii) Estimate trend by 3-yearly Moving Average Method for the following data :

Year	1961	1962	1963	1964	1965	1966	1967	1968	1969
Yield of Wheat pre acre	10.13	11.54	9.32	9.13	10.52	8.32	11.13	11.52	10.54

(c) (i) For a trivariate data, explain the terms Multiple Correlation Coefficient and Partial Correlation Coefficient.

(ii) Compute Correlation Coefficient between Values of X and Y given below :

X	2	4	5	6	8	11
Y	18	12	10	8	7	5

(d) The first four raw moments are 1, 4, 10 and 46. Compute Skewness and Kurtosis of the distribution using a measure based on moments. Comment upon the Skewness and Kurtosis of Data Set.

Q.5) Attempt **any two** of the following :   **[2x8=16]**

(a) The following table gives values of Mean and Range for 12 samples each of size 4. Construct $\overline{X}$-chart and R-chart. Decide whether process is within control or not.

(For n = 4, A_2 = 0.729, D_3 = 0, D_4 = 2.282)

Sample No.	1	2	3	4	5	6	7	8	9	10	11	12
Mean	42	41	40	46	39	47	40	36	42	40	44	45
Range	5	3	7	1	6	3	3	5	3	5	3	5

(b) (i) Explain concept of Multiple Regression and give a real life situation where it can be used.

(ii) If $r_{12.3} = 0$, then show that

$$r_{13.2} = r_{13}\sqrt{\frac{1 - r_{23}^2}{1 - r_{12}^2}}$$

(c) In a trivariate distribution

$$\overline{X_1} = 48.7, \qquad \overline{X_2} = 59.8, \qquad \overline{X_3} = 78$$

$$_1 = 3.2, \qquad _2 = 5.4, \qquad _3 = 7.6$$

$$r_{12} = 0.4, \qquad r_{13} = 0.6, \qquad r_{23} = 0.5$$

Find :

(i) $R_{1.23}$

(ii) $r_{23.1}$

(iii) Find equation of plane of regression of X_3 on X_1 and X_2.

(iv) Hence find value of X_3 when $X_1 = 30$ and $X_2 = 47$.

(d) (i) Prepare a stem and leaf chart :

163, 168, 161, 172, 154, 161, 152, 158, 171, 148, 156, 152, 164, 147, 145, 151, 154, 145, 159, 153, 159, 156, 146, 162, 153, 165, 162, 151

(ii) What is Trimmed Mean ?

Determine 20% trimmed mean for a set of 10 values.

10, 7, 6, 8, 10, 12, 5, 15, 18, 20.

Total No. of Questions : 5]   [Total No. of Printed Pages : 6

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F. Y. B. Sc. (Computer Science) Examination - 2010
STATISTICS
PAPER - II
STATISTICAL METHODS - II
(New 2008 Pattern)

Time : 3 Hours]   [Max. Marks : 80

Instructions :

    (1) All questions are compulsory.

    (2) Figures to the right indicate full marks.

    (3) Use of single memory, non-programmable, scientific calculator and statistics tables is allowed.

    (4) Symbols have their usual meanings unless otherwise stated.

Q.1) Attempt **each** of the following :   [8x2=16]

    (a)   Distinguish between a Discrete Sample Space and a Continuous Sample Space.

    (b)   If for the events A and B defined on the sample space Ω, $P(A) = 0.7$, $P(B) = 0.6$, $P(A \cup B) = 0.9$, find $P(A \cap B)$, $P(A \cap B')$

    (c)   Define :

        (i)   Independence of two events A and B on Ω.

        (ii) Mutual Exclusiveness of A and B.

    (d)   Let X be a random variable such that $E(X) = 1$ and $\text{var}(X) = 5$. Compute $E(3X + 4)$, $\text{var}(3X + 4)$.

    (e)   Let $X \rightarrow B(n, p)$. State relationship between Mean and Variance of X.

[3818]-8   1   P.T.O.

(f)   Let X be a continuous variable with probability density function
       as

       $$f(x) = \begin{cases} 6x(1-x), & 0 < x < 1 \text{ otherwise} \\ 0 \end{cases}$$

       find distribution function of X.

(g)   State Central Limit Theorem.

(h)   The amount of time in hours that a computer functions before
       breaking down is a continuous random variable with probability
       density function given by,

       $$f(x) = \begin{cases} \dfrac{1}{100} e^{-x/100} & , x \geq 0 \\ 0 & \text{otherwise} \end{cases}$$

       (i)   Identify distribution of X.

       (ii)   Find mean of the distribution.

Q.2) Attempt **any four** of the following :   [4x4=16]

(a)   A class contains 5 South Indians, 4 Gujaratis, 8 Maharashtrians
       and 3 Jains. A student is selected at random to represent the
       class. Find probability that the selected student is

       (i)   A South Indian

       (ii)   A Maharashtrian

       (iii) A Maharashtrian or a Jain

(b)   Define the following terms :

       (i)   An Event

       (ii)   Exhaustive Events

       (iii) Complement of an Event

       (iv)   Relative Complement of an Event

(c) Let A and B be two events defined on the sample space (Ω) with $P(A) = \frac{1}{3}$, $P(B) = \frac{1}{4}$, $P(A \cap B) = \frac{1}{12}$. Find :

    (i) $P(A/B)$

    (ii) $P(B/A)$

    (iii) $P(B/A')$

(d) State classical definition of probability of an event. Also, state limitations of classical definition.

(e) If two dice are thrown, what is the probability that sum of the numbers on the dice is :

    (i)   greater than 8.

    (ii)   neither 7 nor 11.

(f) A box contains 6 red, 4 white and 5 black balls. A person draws 4 balls from the box at random. Find probability that among the balls drawn, there is at least one ball of each colour.

Q.3) Attempt **any four** of the following :   **[4x4=16]**

(a) If A and B are independent events defined on sample space (Ω), then show that :

    (i)   A and B' are independent.

    (ii)   A' and B' are independent.

(b) Following is the distribution function of a discrete random variable X.

X	0	1	2	3	4	5
f(x)	0.05	0.25	0.40	0.65	0.80	1.00

Find :

    (i)   Probability Distribution of X.

    (ii) $P(X \geq 4 \ / \ X > 2)$

    (iii) $E(X)$

(c) Define each of the following :

    (i)   Discrete Random Variable

    (ii)   Probability Mass Function of a Discrete Random Variable

    (iii) Mean of a Discrete Random Variable

    (iv) Distribution function of a Discrete Random Variable

(d) If random variable x has discrete uniform distribution with parameter n. Find the value of n if :

    (i)   var(x) = E(x)

    (ii)   E(x) = 3 var(x)

(e) State probability mass function of Binomial Distribution and Poisson Distribution. When Binomial Distribution can be approximated by Poisson Distribution ?

(f) A Poisson Variate x is such that

P(x = 1) = 2 P(x = 2)

Find values of P(x = 0), mean and variance of x.

Q.4) Attempt **any two** of the following :   **[2x8=16]**

(a) (i) Consider the following function :

$$f(x) = \begin{cases} e^{-x} & , x \geq 0 \\ 0 & \text{otherwise} \end{cases}$$

Verify whether above function can be considered as probability density function of a random variable x. If yes, find E(x) and var(x).

(ii) Define Uniform Distribution over an interval [a, b]. State expressions for its mean, variance and distribution function.

(b) (i) The time (in hours) required to repair a machine is exponentially distributed with mean 5. What is the probability that the repair time exceeds 3 hours ? Also find conditional probability that a repair takes at least 10 hours, given that its duration exceeds 8 hours ?

(ii) Define Normal Distribution. Also state important properties of Normal Distribution.

(c) (i) Define the terms :

Test Statistic, Critical Region, Level of Significance, Parameter

(ii) A group of 1,000 children is given an Intelligence Test. The scores in the Intelligence Quotient (IQ) test are normally distributed with mean 100 and standard deviation 16. What proportion of the group will have IQ above 150 ? How many will have IQ below 75 ?

(d) (i) Explain procedure of testing $H_0 : \mu = \mu_0$ against $H_1 : \mu \neq \mu_0$ for a large sample at $\alpha\%$ level of significance.

(ii) A manufacturer of light bulbs claims that on an average 4% of the bulbs manufactured by his firm are defective. A random sample of 500 bulbs contained 19 defective bulbs. On the basis of this sample can you support manufacturer's claim at 5% level of significance ?

Q.5) Attempt **any two** of the following : [2x8=16]

(a) (i) Explain stepwise procedure of paired t-test.

(ii) The annual rainfall at a certain place is normally distributed with mean 30 inches. If the rainfall during the past 8 years are 31.1, 30.7, 24.3, 28.1, 27.9, 32.2, 25.4, 29.1. Can we conclude that average rainfall during past 8 years is 30 inches ?

(b)   (i)   Write stepwise procedure for testing a goodness of fit.

       (ii)   With the help of the following data find out whether there is any relationship between Smoking and Drinking. Use 1% level of significance :

	Drinking	Not Drinking
Smoking	60	40
Not Smoking	30	70

(c)   (i)   What is Box-Muller Transformation ? Explain how it is used in obtaining a model sample from $N(\mu, \sigma^2)$ distribution.

       (ii)   The following data represents time in minutes that a patient has to wait during 12 visits to a doctor's office before being seen by the doctor :

              12, 17, 15, 20, 20, 32, 28, 26, 25, 35, 25, 24.

              Use sign test at 5% level of significance to test doctor's claim that the median waiting time for his patients is 20 minutes before being admitted to the examination room.

(d)   (i)   1,000 independent rolls of a fair die were made. Using normal approximation to binomial distribution, find probability that number 6 will appear on upper most face between 150 and 200 times both inclusive.

       (ii)   Of 10 college girls in a class, 3 have knowledge of R-software, If two of the girls are selected at random, what is the probability that,

              (i)   Both have knowledge of R-software,

              (ii)   Neither has knowledge of R-software,

              (iii) At least one has knowledge of R-software ?