[3718]-1

F. Y. B. Sc. (Computer Science) Examination - 2010
COMPUTER SCIENCE
PAPER - I
INTRODUCTION TO PROGRAMMING AND 'C' PROGRAMMING
(New 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)   Give advantages of 'C' Language.

(2)   What is Source Program and Object Program ?

(3)   'C' is a middle level language. Comment.

(4)   State any four Escape Sequences.

(5)   How many keywords are used in 'C' Language ?

(6)   Give rules to declare an Identifier.

(7)   Give syntax and purpose of go to and label statement.

(8)   How to access data member from a structure ?

(9)   What is the difference between SEEK-SET and SEEK-CUR ?

(10) Explain any two modes in which files can be opened ?

(11) Compare Structure and Union with respect to Memory Management.

(12) Explain difference between Pre-increment and Post-increment Operator.

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

    (a)   Distinguish between Compiler and Interpreter.

    (b)   What is Recursion ? Explain its advantages and disadvantages.

    (c)   Explain any five library functions provided in C to manipulate Strings.

    (d)   Write a note on Preprocessor Directives.

    (e)   Write a note on Command Line Arguments.

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

    (a)   Write an algorithm and draw a flowchart to check whether the given string is palindrome or not.

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

```
#include <stdio.h>
void main( )
{
    char ch = 'A';
    int i = 2;
    float f = ++ch+i;
    printf("%f %d %c", f, ch, ch);
}
```

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

```
#include <stdio.h>
void main( )
{
    int n = 63;
    printf("\n n is %d", n);
    printf("\n n is %2d", n);
    printf("\n n is %4d", n);
    printf("\n n is %6d", n);
    printf("\n n is %-6d", n);
    printf("\n n is %\d", n);
}
```

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

```c
#include <stdio.h>
main( )
{
    int u1, u2;
    int v = 3;
    int * pv;
    u1 = 2 * (v + 5);
    pv = &v;
    u2 = 2 * (* pv + 5);
    printf("\n u1 = %d u2 = %d", u1, u2);
}
```

(e) Complete the following program segment :

```c
void main( )
{
    int n = 5;
    int fact;
    fact = factorial(n);
    printf("%d", fact);
}
```

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

(a) Write a 'C' program to calculate GCD of two numbers.

(b) Write a 'C' program to convert decimal number to binary number using function.

(c) Write a 'C' program to sort given list of numbers in descending order.

(d) Write a 'C' program using pointers to search a substring from the given string.

(e) Write a 'C' program which prints number into words :

for ex. ilp – 123

olp – one two three

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

    (a)   Explain basic datatypes in 'C' Language.

    (b)   What do you mean by Array of Structures ? Explain with example.

    (c)   What is File ? State any four operations on file by giving proper example.

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Total No. of Questions : 5]　　　　　　[Total No. of Printed Pages : 4

[3718]-2

F. Y. B. Sc. (Computer Science) Examination - 2010
COMPUTER SCIENCE
PAPER - II
FILE ORGANISATION AND FUNDAMENTALS OF DATABASE
(New 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 Logical File ?

　(2)　Define 'Fixed Length Records'.

　(3)　What is Query Optimizer ?

　(4)　What is Referential Integrity ?

　(5)　Define Natural Join.

　(6)　Define 'Domain'.

　(7)　Define 'Cardinality' of an Entity.

　(8)　Define 'DCL'.

　(9)　What is Clustering Index ?

　(10)　Define Ordering Field or Key Field of an Ordered File.

　(11)　Explain use of Foreign Key Constraint.

　(12)　List any 2 design goals of Relational Database.

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

　(a)　What are different types of the Database Users ?

　(b)　Consider the relation R = (A, B, C, D, G, H, I) and set of functional dependencies defined on R, F as {A → B, A → C, CG → H, CG → I, B → H}

　　(i)　Compute closure of F i.e. F^+ and

　　(ii)　Compute closure of Attribute Set $(AG)^+$

(c) Write a short note on B$^+$ Tree Index Files.

(d) What is Aggregation ? Explain with example.

(e) State rules to convert E-R diagram into tables.

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

(a) State different File Organisations and explain Heap File Organisation in detail.

(b) Write a note on Referential Integrity.

(c) What is Decomposition of Relation Scheme ?

(d) Write any four functions of DBA.

(e) Differentiate between Weak Entity and Strong Entity with suitable example.

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

(a) Consider the following database relations :

Country(Con-code, Name, Capital)

Population (Pop-code, Population)

Country and Population are related with one to one relationship.

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

(i) List highest population country.

(ii) Give name and population of country whose capital is 'Delhi'.

(iii) Print Countrywise Population.

(b) Consider the following relation :

Teacher (tno, tname, collegename, dept.)
Etest (eno, testname)

Teacher and Etest 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) Count no. of teachers who passed 'Set Exam' of Computer Science.

(ii) Delete all teacher details of 'Maths' Dept.

(iii) Print total no. of teachers passing respective exam.

(c) Consider the following relation :

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

Department (deptno, deptname, location)

Employee and Department are related with many to one relationship.

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

(i)   Find out employees who are working at Ahmednagar city location.

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

(iii) Update commission for every employee by 5% who belongs to 'Computer Department'.

(d) Consider the following relation :

Item (I_no, I_name, I_qty)

Po (p_no, p_date, cost, qty)

Supplier (s_no, s_name, s_addr.)

Item and Po are related with one to many relationship and supplier and Po are related with one to many relationship.

Create a relational database in 3NF and solve the following queries in SQL :

(i)   Find out po_no, po_date and supplier_name of Po which is maximum amount.

(ii) List name of supplier to whom Po is given for 'Mouse'.

(iii) List name of supplier who is going to supply 'Monitor' with minimum cost.

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

(a) Consider the following relationships :

Doctor (doct_no, doct_name, doct_address, doct_city)

Hospital (hosp_no, hosp_name, street, hosp_city)

Doct_Hosp (doct_no, hosp_no, date)

Solve queries in Relational Algebra :

(i)   Find hospital name to which Dr. Padghan has visited.

(ii) Find out all doctors who have visited hospital in the same city.

(iii) List name of hospital to which Dr. Shirsat has visited on 08/01/2010.

(iv) List all doctors who visited 'Padghan Hospital'.

(v) List name of Hospital in 'Shrirampur'.

(b) Consider the following relationships :

Player (pno, name, city)

Game (gno, name, place)

Player_Game (pno, gno, date)

Solve queries in Relational Algebra :

(i) Find list of players playing 'Cricket'.

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

(iii) Find list of players and games played on 'March 4, 2010'.

(iv) List all available games in India.

(v) List players playing cricket and football.

Q.5) (A) Shramik Vidhyapit offers 10 courses on 'Information Technology'. Each course is conducted in several batches, where the maximum batch size is of 50 students. For every batch separate instructor is appointed.

When for a particular course minimum 25 students get admitted, then the timetable is prepared and separate classrooms and also instructors availability, daily one hour is allocated to each batch. As numbers of students is growing, it is difficult to the management to schedule the course.

Suggest a suitable information system to handle the above problem :

(i) Draw Entity-Relation Diagram for the Information System Design.

(ii) Convert Entity-Relationship Diagram into Relational Database in 3NF. **[07]**

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

OR

(B) Write difference between Single Attribute and Multivalued Attribute. **[03]**

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

MATHEMATICS

PAPER - I

DISCRETE MATHEMATICS

(New 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) Write general form of the solutions of a linear homogeneous recurrence relation with constant coefficient if its characteristic equation has roots $-1, -1, -1, 7, 7$.

(b) Write negation of the statement :

"There is an honest politician."

(c) In how many ways may one right and one left shoe be selected from 6 pairs of shoes without obtaining a pair.

(d) Define : Big - O function.

(e) Construct a simple graph G, such that $\lambda(G) = 1 = K(G)$.

(f) Determine whether the following statement is true or false. Justify.

"Every disconnected graph has an isolated vertex."

(g) How many edges are there in a graph with 10 vertices each of degree 6 ?

(h) Find eccentricity of each vertex in the following tree, hence find centre of the tree.
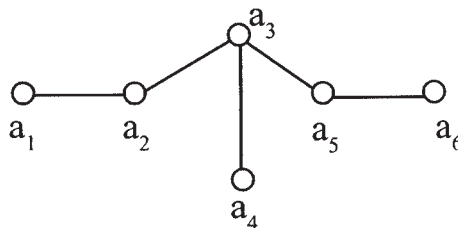
Q.2) Attempt **any four** of the following : [16]

    (a)   Write algorithm to sort an array of numbers by insertion sort method.

    (b)   How many integers between 999 and 9999 either begin or end with 3 ?

    (c)   Solve recurrence relation

$$a_{n+2} + 2a_{n+1} + a_n + 9.2^n$$

    (d)   Test validity of the following argument by method of direct proof.

        "The project will complete iff Prasanna does the field work fast. Either Prasanna does the field work fast or he reads a book. Prasanna does not read a book. Hence the project will be incomplete."

    (e)   How many students do you need in a college to gaurantee that there are atleast two students who have the same first two initials ?

    (f)   Using principle of Mathematical Induction, prove that :

$$2n^3 + 3n^2 + n + 6 > 0 \text{ for } n \geq -2$$

Q.3) Attempt **any four** of the following : [16]
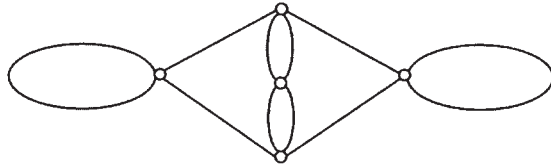
    (a)   Prove that in any graph number of vertices of odd degree is always even.

    (b)   Write incidence and adjacency matrix of the following graph :
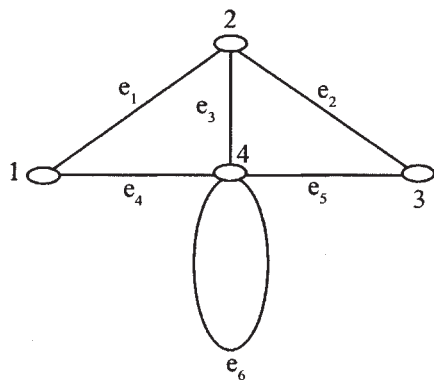
    (c)   Draw a regular bipartite graph on 6 vertices, also find its complement.

(d) Define : Spanning Subgraph.

Draw any two non-isomorphic spanning subgraphs of the following graph :

(e) Draw arborescence of the following expression and write it in polish notation.

$$\left[\frac{ab + 5c}{d(6p + 7)^2} \right]$$

(f) Find maximum and minimum height of a binary tree with 13 vertices. Draw such trees.

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

(a) Find recurrence relation for the number of regions into which the plane divided by n lines, if no two of the lines are parallel and no three of the lines go through the same point. Also find their solution.

(b) (i) Translate the following into symbolic form :

(1) Some horses run faster than some cars.

(2) All integers are rationals.

(ii) Prove the following by Mathematical Induction :

$$2 + 5 + 8 + \ldots + (3n - 1) = \frac{n(3n + 1)}{2} \text{ for all } n \in N.$$

(c) (i) Find least integers n such that $f(x)$ is $0(x^n)$, where $f(x) = 2x^3 + x^2 \log x$.

(ii) Test validity of the following argument by Indirect Method :

$A \lor \sim B, \sim C \to B, A \to \sim D, \vdash \sim D \lor C$

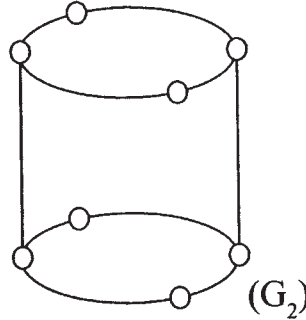(d) How many integers between 1 and 1,000 are divisible by :

(i) 2 or 3 or 5

(ii) 2 and 3 but not by 5

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

(a)   Show that the following two graphs are isomorphic.
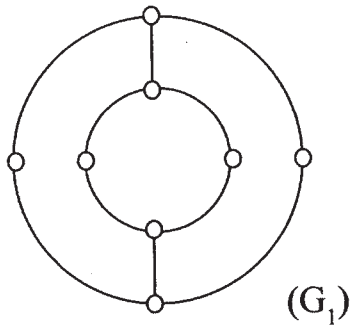
(b)   (i)   For the following graphs G_1 and G_2, find $G_1 \times G_2$.
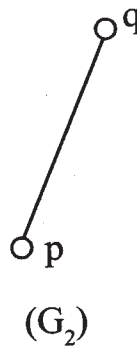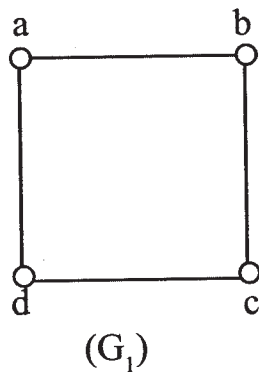
(ii)   For the following graph G, find all fundamental cutset w.r.t. spanning tree T.
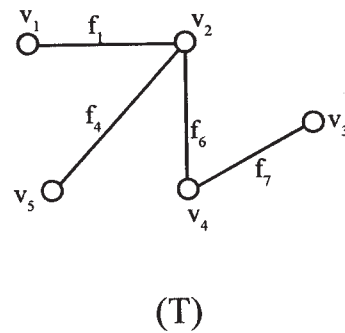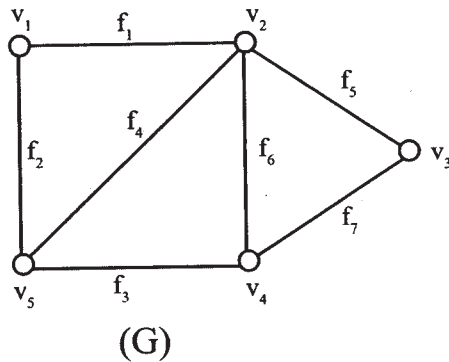
(c)   (i)   Define the following :

(1)   Network in digraph

(2)   Complete Symmetric digraph

(3)   Complement of a graph

(4)   Bridge

(ii) In the following network, determine missing figures, so that the result is a flow in a given network. Also find value of flow.
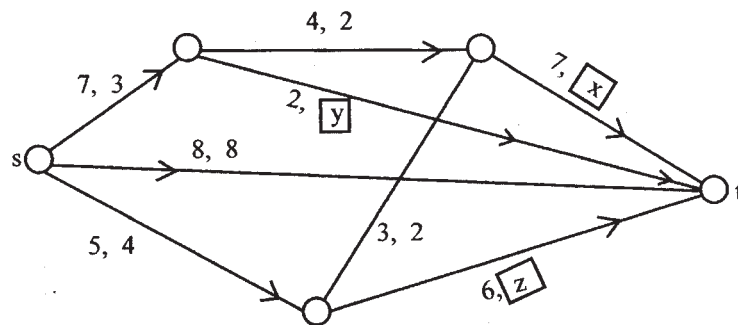
(d) Using Dijkstra's Algorithm find shortest path from vertex 'a' to all vertices in the following graph :
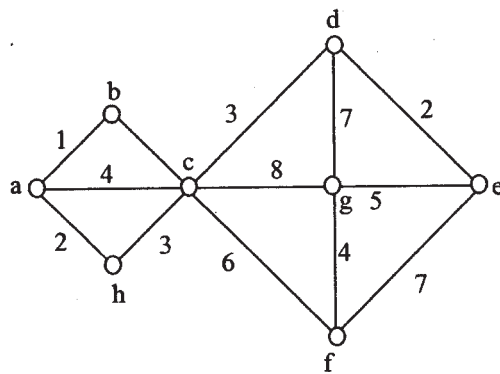
[3718]-4

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

MATHEMATICS

PAPER - III

ALGEBRA AND CALCULUS

(New 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 be any nonempty set.

Is every relation on A an equivalence relation ? Justify.

(b) Let A = {1, 2} and B = {a, b}. List all possible functions from A to B.

(c) Is the following Hasse Diagram a Lattice ? Justify.

(d) Obtain multiplication table for Z_5.

(e) Find limit of sequence $<x_n>$, where

$$x_n = \frac{-n^2 - 3}{\frac{2}{3}n^2 - \frac{7}{3}n}$$

(f) Discuss convergence of the series $\sum_{n=1}^{\infty} \sqrt[3]{n}$.

(g) If $f(x) = \dfrac{1}{x}$, $x \neq 0$, then show that $f(x)$ is not continuous at $x = 0$.

(h) If $y = \log(2x - 5)$, find y_n.

Q.2) Attempt **any four** of the following : [16]
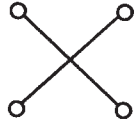
(a) Let $A = \{1, 2, 3, 4\}$ and $R = A \times A$. Is R an equivalence relation on A ? If yes, obtain equivalence class $\bar{3}$.

(b) Is the lattice $(D_{42}, \leq)$ a complemented lattice ? Justify. Here '$\leq$' is a partial order relation 'divides'.

(c) Show that there are precisely n distinct residue classes in module n.

(d) Find remainder when $7^{361} + 7^{362}$ is divided by 11.

(e) If the function $f : \mathbb{R} \to \mathbb{R}$, defined as $f(x) = \dfrac{2x - 3}{7}$ $\forall \, x \in \mathbb{R}$, then show that f is bijective. Hence find f^{-1}.

(f) Prove that in a complemented distributive lattice complement of an element is unique.

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

(a) Show that the sequence $<a_n>$ defined as

$$a_n = \frac{1}{n+1} + \frac{1}{n+2} + \frac{1}{n+3} + \dots\dots + \frac{1}{n+n} \, . \, \forall \, n \in N$$

is convergent.

(b) Discuss convergence of the series $\dfrac{x}{1 \cdot 2} + \dfrac{x^2}{2 \cdot 3} + \dfrac{x^3}{3 \cdot 4} + \dots\dots,$ where x is any real number.

(c) Discuss continuity of f(x), where

$$f(x) = \frac{e^{1/x} - 1}{e^{1/x} + 1} \qquad \text{if } x \neq 0$$

$$= 0 \qquad \text{if } x = 0$$

(d) Verify Cauchy's Mean Value Theorem for the functions $f(x) = e^x$ and $g(x) = e^{-x}$ defined on the interval [a, b].

(e) Evaluate $\lim\limits_{x \to a} \left(\dfrac{a}{x} - \cot \dfrac{x}{a} \right)$.

(f) By Maclaurin's Series, expand real valued function $f(x) = -\cos x$.

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

(a) Using Warshall's Algorithm, obtain transitive closure of relation $R = \{(1, 2) (2, 2) (2, 4) (3, 2) (3, 4) (4, 1)\}$ on the set $A = \{1, 2, 3, 4\}$.

(b) Find greatest common divisor of 7677 and 4647. Hence find m and n such that $d = 7677.m + 4647.n$.

(c) Prove that any two integers a and b, $a \equiv b \pmod{n}$ if and only if a and b leave the same remainder when divided by n.

(d) Write Boolean Expression $f(x) = (x \lor y) \land \overline{z}$ in disjunctive normal form.

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

(a) State Leibnitz's Theorem and hence prove that if $y = \sin(m \sin^{-1}x)$ then $(1 - x^2) y_{n+2} = (2n + 1) xy_{n+1} + (n^2 - m^2)y_n$.

(b) State and prove Rolle's Mean Value Theorem. Explain geometric interpretation of Rolle's Theorem.

(c) State Taylor's Theorem with Lagranges Form of the remainder. Also by assuming the validity of expansion, expand $e^x \cos x$ in ascending power of $\left(x - \dfrac{\pi}{4} \right)$.

(d) (i) Discuss convergence of the sequence $\langle a_n \rangle$ where a_n is given by $a_{n+1} = \sqrt{3a_n}$, $a_1 = 1$.

(ii) Discuss convergence of the series $\displaystyle\sum_{n=1}^{\infty} \dfrac{\left(1 + \dfrac{1}{n} \right)^{2n}}{e^n}$

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

ELECTRONICS

PAPER - I

ELECTRONIC DEVICES, CIRCUITS AND COMPUTER PERIPHERALS

(New 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 the following :   [8x2=16]

    (a) Draw Symbols of Ideal Current Source and Ideal Voltage Source.

    (b) Define the given terms w.r.t. P-N Junction Diode :

        Knee Voltage, Peak Inverse Voltage (PIV)

    (c) State any two advantages of FET over BJT.

    (d) Draw output characteristics of C.E. Configuration.

    (e) State types of amplifier based on Q Point Position.

    (f) Find frequency of oscillation for phase shift oscillator if R = 10kΩ and C = 0.01 µF.

    (g) Draw block diagram of Linear Regulated Power Supply.

    (h) State any four components of Motherboard.

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

(a) Explain working principle of Zener Diode.

(b) Explain FET as Voltage Variable Resistor (VVR).

(c) Define the following terms w.r.t. Op-Amp :

 (i) CMRR

 (ii) PSRR

 (iii) Slewrate

 (iv) Input Bias Current

(d) Draw and explain block diagram of SMPS.

(e) Give various steps involved in image formation in LASER Printer. State any two advantages of LASER Printer.

(f) Explain Transistor as an Amplifier.

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

(a) Find current flowing through Resistor R_3 in the following circuit using Kirchoff's Laws :
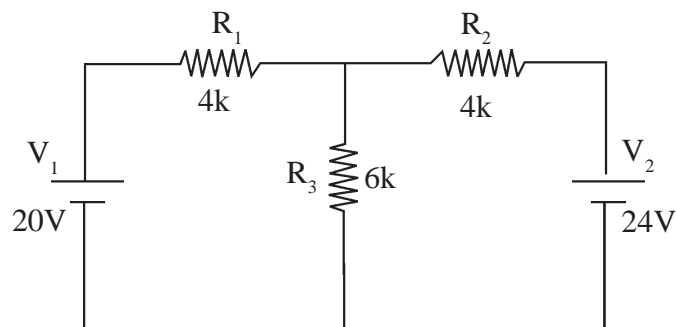
(b) Draw circuit diagram of Inverting Operational Amplifier and derive Relation for its Output Voltage.

(c) Explain working principle of Photodiode.

(d) Explain need of UPS. Draw block diagram of Online UPS.

(e) Explain concept of reading data from a C.D. ROM.

(f) Draw circuit diagram of Hartley Oscillator. Explain its working and write an expression for its frequency of oscillation.

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

(a)   Explain working principles of :

    (i)   Scanner

    (ii)   Light Pen

(b)   With neat diagram and waveforms, explain working of Full Wave Rectifier. Compare Half Wave and Full Wave Rectifier.

(c)   (i)   Draw circuit diagram of Op-Amp Subtracter and derive expression for its Output Voltage.

    (ii)
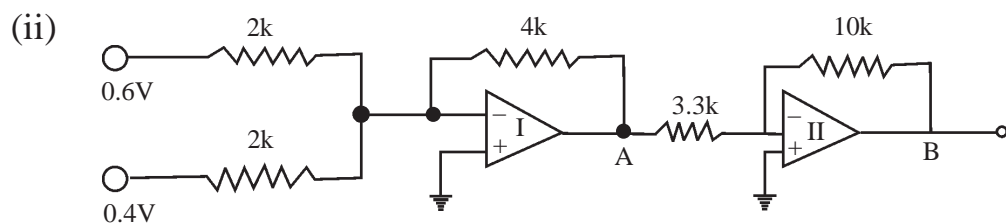
    Identify Op-Amp configurations in the above circuit. Write expression for output of each circuit and find voltages at points A and B.

(d)   (i)   Define α and β of transistor. Derive equation of α in terms of β.

    (ii)   Draw D.C. Load Line for the following circuit :
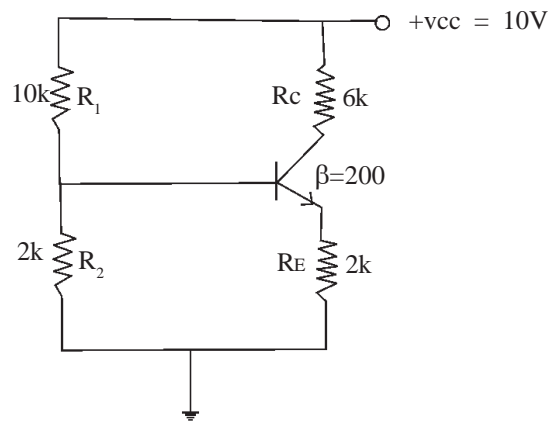
Q.5) Attempt **any one** of the following : [1x16=16]

(a) (i) Find Thevenin's and Norton's Equivalent Circuit for the following circuit :
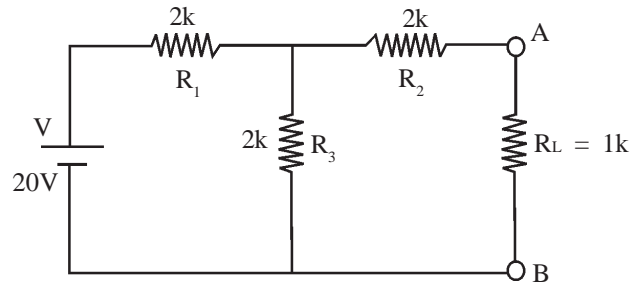
(ii) Explain working principle of n-channel enhancement only MOSFET. Define the following terms :

(1) D.C. Drain Resistance

(2) A.C. Drain Resistance

(3) Transconductance

(4) Amplification Factor

(b) (i) (1) Draw circuit diagram of Op-Amp differentiator. Derive an expression for its Output Voltage.

(2) Explain need of Multistage Amplifier. A cascaded amplifier has voltage gains $A_1 = 10$, $A_2 = 20$, $A_3 = 40$. What is the overall voltage gain in decibel ?

(ii) Explain working principle of CRT and LCD Display.

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Total No. of Questions : 5] [Total No. of Printed Pages : 3

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

PAPER - I

INTRODUCTION TO COMPUTERS, DATA PROCESSING AND NETWORKING

(Old 2004 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 meant by Batch Files ?

    (2) Explain function of Control Panel.

    (3) What do you mean by Plotters ?

    (4) Explain difference between ASCII and EBCDIC.

    (5) What is meant by Wild Card Characters ? Explain with proper example.

    (6) Define Network Topology.

    (7) Explain Applications of HTML.

    (8) Define Domain Name System.

    (9) Explain requirements for sending an e-mail.

    (10) Explain any two accessories of MS-Windows.

    (11) What are the types of Mouse ?

    (12) What is the role of Touch Screen ?

Q.2) Attempt **any four** :   [5x4=20]

(a) State difference between DOS and Linux.

(b) Explain CD-ROM in detail.

(c) What are the Application Areas of Computers ?

(d) Explain how to ensure LAN Security ?

(e) Explain various Components of Application Windows in MS-Windows.

Q.3) Attempt **any four** :   [5x4=20]

(a) What are the features of MS-EXCEL ?

(b) Explain any five External DOS Commands in detail.

(c) What is meant by Vi Editor ? Explain three modes of Vi Editor.

(d) Define CGI. State features of PERL.

(e) Write purpose and syntax of the following commands with example :

   (i)   tail

   (ii) WHOAMI

   (iii) more

   (iv) ATTACH

   (v)   echo

Q.4) Attempt **any four** :   [5x4=20]

(a) Explain in detail for grep and wc command in Linux.

(b) Explain attributes of <IMG> tag by giving proper examples.

(c) What is meant by Scanning Devices ? Explain any two Scanners in detail.

(d) Explain purpose and syntax of decision-making statements in shell by giving proper example.

(e) What is the role of Printer ? Explain any two types of Printers in detail.

Q.5) Attempt **any two** :   **[5x2=10]**

(a)   Write HTML code which will generate the following output :

> **Indian Games**
>
> 1. Cricket
>
> 2. Kabaddi
>
> 3. Kho-kho
>
> 4. Hockey
>
> **Indian Cities**
>
> • Delhi
>
> ■ Mumbai
>
> ○   Chennai

(b)   Write a shell program to calculate sum of digits of numbers.

(c)   A file, employee.lst, contains emp_no, emp_name, designation, basic.

Calculate total of hra, da and basic pay of all supervisors in the file employee.lst (Basic is the 4th field). Consider rules for hra = 15% of basic and da = 50% of basic. Write an awk code for above.

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Total No. of Questions : 5] [**Total No. of Printed Pages : 4**

[3718]-52

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

COMPUTER SCIENCE

PAPER - II

INTRODUCTION TO PROGRAMMING AND PROGRAMMING IN 'C'

(Old 2004 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 the difference between Machine and Assembly Languages ?

  (2) What do you mean by Keywords ? List any two Keywords.

  (3) Give purpose and syntax of Enumeration Constant.

  (4) What is the difference between getch( ) and getche( ) functions ?

  (5) What will be the value of b and c variables for execution of the following code :

```
int a = 5;
b = ++a;
c = a -- ;
```

  (6) What is the role of break and continue statements in 'C' Language ?

  (7) State difference between Actual and Formal Parameters.

  (8) Explain purpose and syntax of malloc( ) function.

  (9) What is the use of tolower( ) and toupper( ) functions ?

  (10) Explain how memory utilization happens in Union ?

  (11) Explain any two functions available in math.h file.

  (12) Give Syntax and example for drawing a Line.

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

(a) What is meant by Pointer ? Explain Arithmetic Operations with Pointer Variables.

(b) What is the difference between if-else and switch statements ? Explain their use in detail.

(c) Define Recursion. Write a recursive function for finding factorial of a given number.

(d) What is the Scope of Variables ? Explain any two storage classes in detail.

(e) Explain in detail structure within structure by giving proper example.

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

(a) Write an algorithm and draw a flowchart to print sum of digits of a given number. (Ex. 579   21)

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

```
#include <stdio.h>

main( )

{

 int lno, count, a = 1, n = 4;

 for (lno = 1; lno < = n; lno++)

   {

       for (count = 1; count < = lno; count++)

       {

          printf("%d \ t", a);

          a++;

       }

       printf("\n");

   }

}
```

(c) Complete program by writting proper function definitions :

```c
#include <stdio.h>
main( )
{
    int n, s, c;
    printf("Enter a number :");
    scanf("%d", & n);
    s = sqr(n);
    c = cube(n);
    printf("\n square of number is %d", s);
    printf("\n cube of number is %d", c);
}
```

(d) Find output of each code by using the given values :

```
a = 1101     b = 0111
printf("\n %d", a & b);
printf("\n %d", a|b);
printf("\n %d", a      b);
printf("\n %d", a<<3);
printf("\n %d", ~ a);
```

(e) Find and justify output of the following program :

```c
#include <stdio.h>
#include <string.h>
main( )
{
    char s1[40] = "Hello !";
    char s2[ ] = "How are you ?";
    int a, i;
    strcat (s1, s2);
    a = strlen(s1)
    i = 0,
    while (i < a)
    {
        printf("%c", s1[i]);
        i++;
    }
}
```

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

(a) Write a 'C' program to calculate distance between two points using the formula,

$$d= \sqrt{(y_2 - y_1)^2 + (x_2 - x_1)^2}$$

(b) Write a 'C' program to accept a character and check whether it is an alphabet, digit or a special symbol. If it is an alphabet, check whether it is uppercase or lowercase.

(c) Write a 'C' program to display first n terms of the fibonacci series.

(d) Write a 'C' program for addition of two matrices.

(e) Write a 'C' program to accept a number and check whether it is a perfect number.

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

(a) Write a note on 'C' preprocessor directives.

(b) Write syntax and usage of :

    (i) ftell( )

    (ii) strcpy( )

    (iii) fscanf( )

    (iv) ellipse( )

    (v) calloc( )

(c) Write advantages of Command Line Arguments. Also write a program to demonstrate creation and execution of Command Line Arguments by giving proper example.

[3718]-53

F. Y. B. Sc. (Computer Science) Examination - 2010
MATHEMATICS
PAPER - I
DISCRETE MATHEMATICS
(Old 2004 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) Determine wheather the following statement is true or false :
"If Monkeys can fly, then $1 + 1 = 3$."

    (b) How many permutations of the letters a, b, c, d, e, f, g end with a ?

    (c) Solve recurrence relation $a_n + \dfrac{1}{2} a_{n-1} = 0$.

    (d) Construct generating function for the sequence
5, 10, 15, 20, 25...

    (e) Draw a 3-regular graph on 2 vertices.

    (f) If graph G has 20 vertices and T be its spanning tree, then find number of edges in T.

    (g) Find cut vertex and vertex connectivity in the following graph :
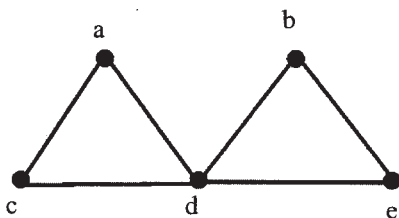
    (h) Does there exist a simple graph with 10 vertices and 46 edges ? Justify.

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

    (a)   Prove validity of the following argument :

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

    (b)   Solve recurrence relation

$$a_n - 5a_{n-1} + 6a_{n-2} = 3 + 2n.$$

    (c)   How many ways are there to distribute 9 different chocolates among 3 children if each child gets at least one chocolate ?

    (d)   Use mathematical induction to prove "3 divides $n^3 + 2n$", wherever n is a positive integer.

    (e)   How many 4-digit numbers can be formed using the digits 0, 3, 5, 8 ?

    (f)   How many solutions are there to the equation

$$x_1 + x_2 + x_3 + x_4 = 17, \ x_i \geq 2, \ \text{for} \ i = 1, 2, 3, 4 \ ?$$

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

    (a)   Using Kruskal's Algorithm, find a minimum weighted spanning tree for the following graph :
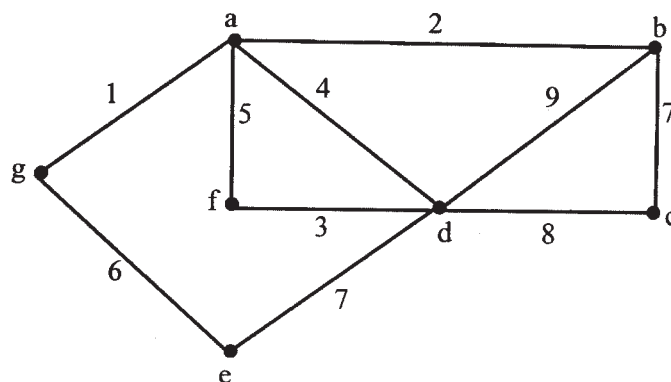
    (b)   Using Fleury's Algorithm, find Euler Walk in the following graph :
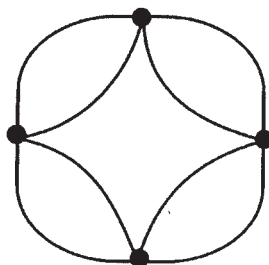
    (c)   Determine number of vertices and number of edges in the spanning tree of the complete bipartite graph $K_{2,n}$.

(d) Find smallest integer n such that K_n has at least 600 edges.

(e) Draw a graph that has a Hamiltonian Path but does not have Hamiltonian Circuit.

(f) Define :

(i) Saturated Path

(ii) Strongly Connected Digraph

(iii) Isthmus

(iv) Regular Graph

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

(a) Find solution to the recurrence relation

$$a_n = 2a_{n-1} + a_{n-2} - 2a_{n-3} \text{ for } n \geq 3$$

with $a_0 = 3$, $a_1 = 6$, $a_2 = 0$

(b) In how many ways can 25 identical donuts be distributed to four police officers so that each officer gets at least three but no more than seven donuts ?

(c) (i) Translate the following into symbolic form using quantifiers :

"There are some students who like bikes but not cars."

(ii) Using Mathematical Induction, prove that every integer $n \geq 64$ can be expressed as $n = 5x + 17y$ for some $x, y \in \mathbb{N} \cup \{0\}$.

(d) (i) Test validity of the following argument by direct proof

$c \lor \sim a, \sim a \rightarrow b, c \vdash \sim b$

(ii) Find coefficient of x^{25} in the expansion of $(x^3 + x^4 + x^5 + \ldots)^3$.

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

(a) Prove that a connected graph is Eulerian if and only if all the vertices are of even degree.

(b) Use Dijkstra's Algorithm to find shortest path from a to f.
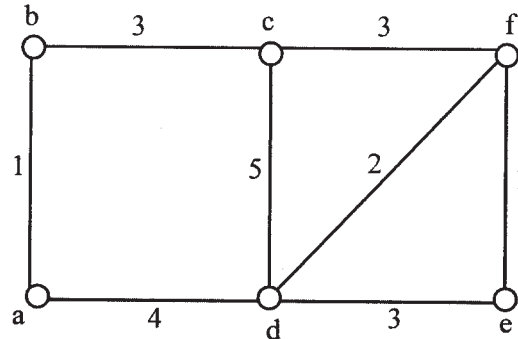
(c) (i) Draw arborescence of the following expression :

$$\left(ab \div \left(c^d - (2)\,(3)\right)\right) + xy + 2$$

(ii) Are the following two graphs isomorphic ? Explain :
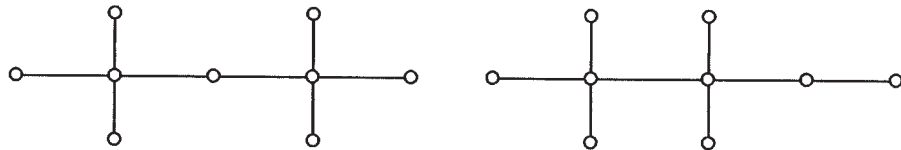
(d) (i) Give example of a graph which is :

(1) Eulerian and Hamiltonian

(2) Eulerian but not Hamiltonian

(ii) Find maximal flow in the following network by Ford and Fulkerson's Algorithm :
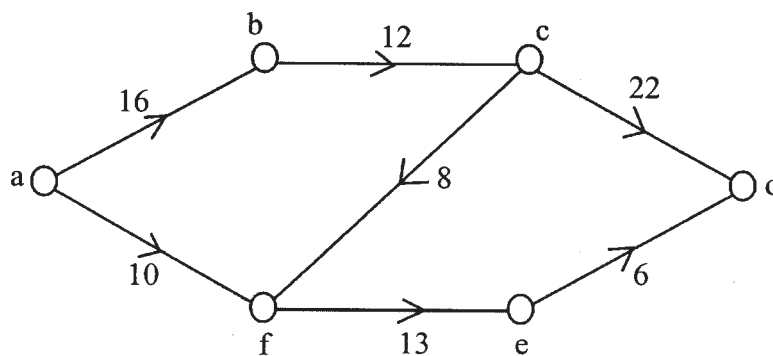
[3718]-54

F. Y. B. Sc. (Computer Science) Examination - 2010
MATHEMATICS
PAPER - II
ALGEBRA AND NUMERICAL METHODS
(Old 2004 Pattern)

Time : 3 Hours]　　　　　　　　　　　　　[Max. Marks : 80

Instructions :

> *(1) All questions are compulsory.*
>
> *(2) Figures to the right indicate full marks.*
>
> *(3) Neat diagram must be drawn wherever necessary.*
>
> *(4) Use of scientific, non-programmable calculator is allowed.*

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

(a) Find modulus and argument of the complex number $\dfrac{1}{i-1}$.

(b) Give an example of Antisymmetric Relation.

(c) Show that the numbers 221 and 2090 are relatively prime to each other.

(d) Find $\phi(12) + \phi(13)$, where ϕ is Euler's ϕ - function.

(e) Prove that $\nabla \equiv 1 - E^{-1}$.

(f) Evaluate $\int\limits_{0}^{3} x^2 dx$ by Simpson's $\dfrac{1}{3}$rd rule. (Take h = 1)

(g) Given that $1 + \dfrac{dy}{dx} = x$ with y(0) = 0.

Find y(0.1) by Euler's Method.

(h) Write an algorithm to find factorial of an integer n > 0.

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

(a) Determine locus represented by $|Z - 1| + |Z + 1| = 3$.

(b) Let R be a relation on A = {1, 2, 3, 4} defined as "aRb if and only if a = b + 1". Write relation set and matrix of the relation.

(c) Show that congruence relation is an equivalence relation.

(d) Prove that, if p is a prime, a, b ∈ Z and p | ab then p | a or p | b.

(e) Find real root of the equation $x^3 + x - 1 = 0$ by Bisection Method (Perform four iterations only).

(f) Let f : ℝ → ℝ be defined as f(x) = 2x + 7, ∀ x ∈ ℝ. Show that f is one-one and onto. Also obtain formula for f^{-1}.

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

(a) Given $\dfrac{dy}{dx} = y^2 - x$ with y(0) = 1.

Find y(0.2) by Taylor's Series Method.

(b) Solve the following system of linear equations by Gauss Elimination Method :

x + 2y + 3z = 1
4x + 5y + 6z = 2
7x + 9y + 8z = 3

(c) If $u_0 + u_8 = 1.9243$, $u_1 + u_7 = 1.9590$, $u_2 + u_6 = 1.9823$, $u_3 + u_5 = 1.9956$, then find u_4.

(d) Evaluate $\displaystyle\int_0^1 \dfrac{dx}{1 + x}$ by Simpson's $\dfrac{3}{8}$th rule. (Take h = 0.1)

(e) Write an algorithm to find greatest common divisor of two non-zero integers.

(f) Find $\dfrac{dy}{dx}$ and $\dfrac{d^2y}{dx^2}$ at x = 1 from the following data :

x	−2	−1	0	1	2
y	−9	−1	1	3	11

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

(a) For $n \in Z$, $\theta \in \mathbb{R}$, prove that,

$(\cos\theta + i \sin\theta)^n = \cos(n\theta) + i \sin(n\theta)$.

(b) Solve the following system of linear equations by Gauss - Seidel Iterative Method (perform three iterations) :

$10x_1 + x_2 + x_3 = 12$; $2x_1 + 10x_2 + x_3 = 13$; $x_1 + x_2 + 10x_3 = 7$.

(c) Obtain Newton-Raphson Formula for finding a real root of the equation $f(x) = 0$.

Hence find a real root of $x^3 + 2x - 5 = 0$.

(d) Find greatest common divisor d of two integers 3624 and 2436. Hence find m and n such that $d = 3624 m + 2436 n$.

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

(a) Using Runge-Kutta Second Order Formula, find y(1.1) and y(1.2), given that $\dfrac{dy}{dx} = x - y$ with $y(1) = 2$.

(b) Derive Newton-Gregory Forward Interpolation Formula. Hence find f(4.7) from the following table :

x	0	2	4	6	8	10	12
y = f(x)	12	7	6	7	13	32	77

(c) Derive Simpson's $\dfrac{1}{3}$rd rule.

Hence evaluate

$\displaystyle\int_{-2}^{2} \dfrac{1}{1+ x^2} \, dx$ (Take h = 0.5)

(d) Write an algorithm for reversing an array. Hence reverse the number 12345.

[3718]-55

F. Y. B. Sc. (Computer Science) Examination - 2010
MATHEMATICS
PAPER - III
GEOMETRY AND CALCULUS
(Old 2004 Pattern)

Time : 3 Hours]   [Max. Marks : 80

Instructions :

    (1) All questions are compulsory.

    (2) Figures to the right indicate full marks.

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

  (a)   Find vector equation of a line passing through a point (2, 3, −1) and parallel to the vector $\bar{i} + 2\bar{j} + \bar{k}$.

  (b)   Find angle between the planes $r \cdot \left(-4\bar{i} + \bar{j} - 8\bar{k} \right) = 7$ and $\bar{r} \cdot \left(-\bar{i} - 2\bar{j} - 2\bar{k} \right) = 5$.

  (c)   Can the numbers $-\dfrac{1}{\sqrt{2}}, \dfrac{1}{2}, \dfrac{1}{3}$ be direction cosines of a line ? Justify.

  (d)   Find perpendicular distance of the plane $\bar{r} \cdot \left(2\bar{i} + \bar{j} - 3\bar{k} \right) = 5$ from the origin.

  (e)   State Maclaurin's Theorem with Lagrange's Form of Remainder.

  (f)   If the function f(x) = logx satisfies L.M.V.T. on [1, e], then find c.

  (g)   Discuss convergence of the series $\displaystyle\sum_{n=0}^{\infty} \dfrac{1}{n!}$

  (h)   Evaluate $\displaystyle\lim_{x \to 0} x^x$

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

(a) Derive vector equation of a line passing through given two points $A(\bar{a})$ and $B(\bar{b})$. Hence deduce corresponding non-parametric form of equation.

(b) Find angle between the line

$$\bar{r} = 2\bar{i} - 3\bar{j} + 4\bar{k} + t\left(\bar{i} + 2\bar{j} + 2\bar{k}\right)$$

and the plane $\bar{r} \cdot \left(2\bar{i} + 2\bar{j} + \bar{k}\right) = 4$.

(c) Find shortest distance between the lines

$$\bar{r} = \left(-2\bar{i} - 3\bar{j}\right) + s\left(3\bar{i} + 2\bar{j} + 2\bar{k}\right) \text{ and}$$

$$\bar{r} = \left(\bar{i} - 4\bar{j} + 2\bar{k}\right) + t\left(2\bar{i} + 3\bar{j} + 4\bar{k}\right).$$

(d) Derive vector equation of a plane in normal form. Hence deduce corresponding cartesian form.

(e) Prove that the points $A\left(\bar{a} - \bar{b} + \bar{c}\right)$,

$B\left(3\bar{a} + 4\bar{b} - 9\bar{c}\right)$ and $C\left(-5\bar{a} - 16\bar{b} + 31\bar{c}\right)$ are collinear.

(f) Find point where the line

$$\bar{r} = \left(2\bar{i} - \bar{j} + \bar{k}\right) + t\left(\bar{i} + 2\bar{j} - 5\bar{k}\right) \text{ crosses xy–plane.}$$

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

(a) Expand $x^3 - 4x + 5$ in ascending powers of $(x + 1)$.

(b) State and prove "Cauchy's Mean Value Theorem".

(c) Show that the sequence $<x_n>$, is convergent where $x_1 = \sqrt{3}$, $x_{n+1} = \sqrt{3x_n}$.

(d) Discuss convergence of the series $\sum \dfrac{1}{\sqrt{n + 1} + \sqrt{n}}$.

(e) Evaluate $\displaystyle\lim_{x\to 0}\left(\frac{x^2 + 2\cos x - 2}{x^4}\right)$

(f) Discuss continuity of f(x) at x = 3, where

$$f(x) = \frac{|x - 3|}{x - 3} \quad , \ x \neq 3$$

$$= 0 \qquad , \ x = 3$$

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

(a) By Vector Method, derive formula for the distance between two parallel planes $\bar{r} \cdot \bar{n} = q_1$ and $\bar{r} \cdot \bar{n} = q_2$. Hence find distance between the planes $\bar{r} \cdot \left(2\bar{i} + \bar{j} + \bar{k}\right) = 4$ and

$$\bar{r} \cdot \left(4\bar{i} + 2\bar{j} + 2\bar{k}\right) = 12.$$

(b) If the direction cosines of two lines are connected by the relations $l + m + n = 0$ and $2lm + 2ln - mn = 0$ then find acute angle between these two lines.

(c) Find vector equations of planes bisecting the angle between two planes $\bar{r} \cdot \bar{n}_1 = q_1$ and $\bar{r} \cdot \bar{n}_2 = q_2$. Hence find vector equations of planes bisecting the angle between the planes $\bar{r} \cdot \left(\bar{i} - 2\bar{j} - 2\bar{k}\right) = 6$ and $\bar{r} \cdot \left(2\bar{i} + 3\bar{j} - 6\bar{k}\right) = 7$.

(d) Show that the lines :

$$\bar{r} = \left(\bar{i} + \bar{k}\right) + t\left(3\bar{i} - \bar{j} + 2\bar{k}\right) \text{ and }$$

$$\bar{r} = \left(4\bar{i} - \bar{j} + 3\bar{k}\right) + s\left(\bar{i} - \bar{j} - \bar{k}\right) \text{ intersect.}$$

Also find vector equation of a plane containing them.

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

(a) Prove that an infinite geometric series

$$1 + r + r^2 + ... + r^{n-1} + r^n + ...$$

   (i) converges to $\dfrac{1}{1-r}$ if $|r| < 1$

   (ii) diverges to ∞ if $r \geq 1$

   (iii) oscillates finitely if $r = -1$

(b) State and prove 'Leibnitz's Theorem' for finding n^{th} derivative of product of two functions. Hence find y_n if $y = x^3 e^x$.

(c) Define the following terms and give one example of each :

   (i) Bounded Sequence

   (ii) Oscillating Sequence

   (iii) Convergent Sequence

   (iv) Divergent Sequence

(d) Assuming the validity of expansions, prove that

$$e^x . \sin x = x + x^2 + \dfrac{x^3}{3} - \dfrac{x^5}{30} + ...$$

Total No. of Questions : 5]   [Total No. of Printed Pages : 4

[3718]-56

F. Y. B. Sc. (Computer Science) Examination - 2010
ELECTRONICS
PAPER - I
LINEAR ELECTRONICS
(Old 2004 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 diagrams wherever necessary.

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

  (a) State any four types of Transformer.

  (b) Draw block diagram of Linear Regulated Power Supply.

  (c) State different configurations of BJT. Which one of them is widely used for amplification ?

  (d) Draw symbols of :

    (i) Light Emitting Diode

    (ii) Zener Diode

    (iii) Rectifying Diode

    (iv) Photo Diode

  (e) State conditions of Barkhausen's Criterion for obtaining sustained oscillations.

  (f) State any two applications of FET.

  (g) Give names of any four connectors used in Computer and its peripherals.

  (h) Define the terms with respect to Amplifier :

    (i) Power Gain

    (ii) Band Width

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

   (a)   Draw circuit diagram of Phase Shift Oscillator. Find its frequency of oscillation, if R = 10kΩ and C = 0.1 μF.

   (b)   Explain working of P-N Junction Diode in Forward Biased Mode.

   (c)   Explain working of N-P-N Transistor.

   (d)   Draw and explain block diagram of SMPS.

   (e)   Draw Norton's Equivalent Circuit of the given circuit :
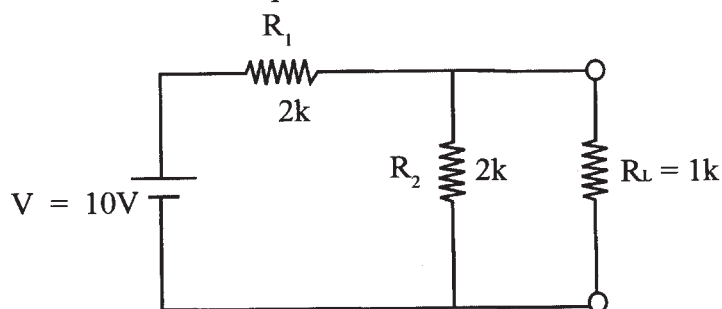
   (f)   Explain charging and discharging of Capacitor through Resistor.

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

   (a)   Explain working principle of Light Emitting Diode. State any two applications of LED.

   (b)   Define α (alpha), β (beta) of Transistor. Find value of Ic, if α = 0.95 and I_B = 20 μA.

   (c)   Explain working principle of any two types of Key Switches.

   (d)   Find current flowing through resistor R_3 using Kirchoff's Laws in the following circuit :
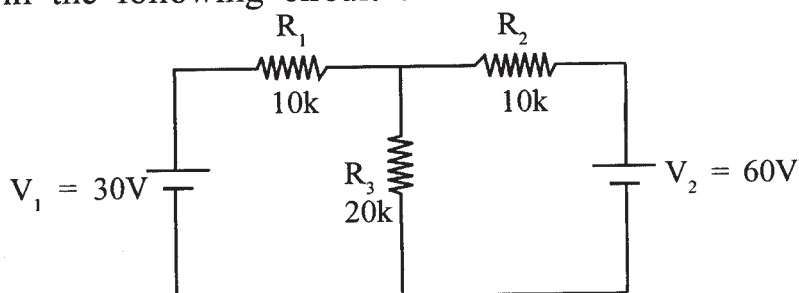
   (e)   Draw circuit diagram of Inverting Amplifier using Op-Amp and derive an expression for its output voltage.

   (f)   Draw circuit diagram of Crystal Oscillator using Transistor. State its advantages.

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

    (a)   Explain working of N-channel Enhancement only MOSFET. Explain how JFET can be used as switch ?

    (b)   (i)   Draw circuit diagram of three input Op-Amp adder circuit and derive an expression for its output voltage.

            (ii)   Define the terms :

                  (1)   Input Offset Current

                  (2)   Input Bias Current

                  (3)   Common Mode Rejection Ratio (CMRR)

                  (4)   Slew Rate

    (c)   Describe different types of Variable Resistors. Find series and parallel equivalent of resistors if R_1 = 15kΩ and R_2 = 20kΩ.

    (d)   State different methods of Transistor Biasing. Which one of them is widely used and draw its circuit diagram. Discuss how stability is achieved in it ?

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

    (a)   (i)   Give statements of :   [04]

                  (1)   KVL

                  (2)   KCL

                  (3)   Thevenin's Theorum

                  (4)   Maximum Power Transfer Theorum

            (ii)   Find voltage across resistance R_3 using Superposition Theorum in the following circuit :   [04]

V_1 = 36V V_2 = 40V

R_1 8k R_2 10k

R_3 20k
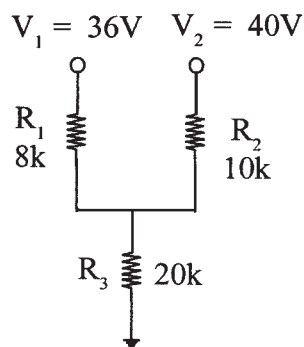
(iii) State different configurations of Differential Amplifier. Draw circuit diagram of Differential Amplifier with constant current source biasing. Explain need of constant current source biasing. **[08]**

(b) (i) Distinguish between BJT and FET. Explain working of N-channel JFET. **[08]**

(ii) Identify configuration for each Op-Amp. Write an expression for output of each. Find voltages at points A and B. **[08]**
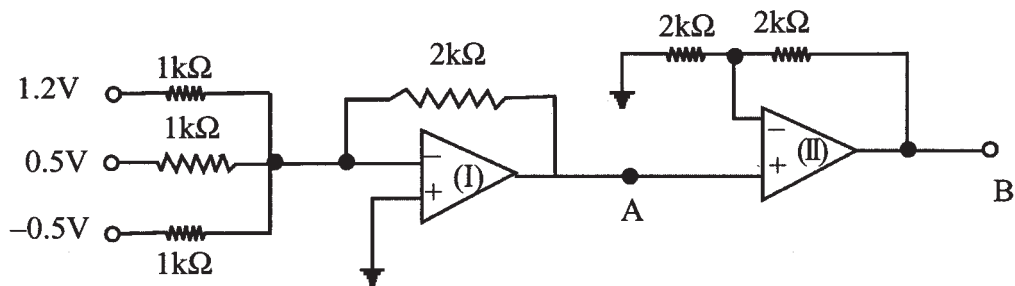
[3718]-57

F. Y. B. Sc. (Computer Science) Examination - 2010
ELECTRONICS
PAPER - II
DIGITAL ELECTRONICS
(Old 2004 Pattern)

Time : 3 Hours]　　　　　　　　　　　　　　[Max. Marks : 80

Instructions :

　　　(1) All questions are compulsory.

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

　　　(3) Draw neat diagrams wherever necessary.

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

　　(a)　Draw logic symbols for :

　　　　(i)　AND Gate

　　　　(ii)　NOR Gate

　　(b)　Convert given decimal number into binary number :

　　　　$(47)_{10}$

　　(c)　Give statements of De-Morgan's Theorem.

　　(d)　Define Encoding.

　　(e)　Define :

　　　　(i)　Accuracy

　　　　(ii)　Resolution

(f) List different types of Shift Register.

(g) Identify the following IC's :
   (i) IC 74158
   (ii) IC 74138

(h) Define Monostable Multivibrator.

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

(a) Perform the following subtraction using 2's Complement Method :
   $(29)_{10} - (34)_{10}$

(b) Simplify the following expression using Boolean Algebra :

   $y = \overline{\left(\overline{A} + B\right)\ \left(\overline{C} + D\right)}$

(c) What is Decoding ? With logic diagram explain working of 3 to 8 decoder.

(d) Draw circuit diagram of Crystal Oscillator using Inverters and explain its working.

(e) Explain working of a 3-bit Ripple Counter with timing diagram.

(f) Find output voltage from 4-bit R-2R ladder type DAC for a digital input 1010. Assume that $0 = 0$ volts and $1 = +10$ volts.

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

(a) What do you mean by Memory Refreshing ? For which type of memory it is required ? Differentiate between SRAM and DRAM.

(b) Construct all basic gates using NAND Gate.

(c) Convert the following into gray code :
   (i) $(31)_8$
   (ii) $(31)_{10}$

(d) Explain weighted and non-weighted codes with suitable examples.

(e) Explain working of Binary Weighted Register type of Digital to Analog Converter.

(f) With logic diagram, explain SR Flip-Flop.

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

(a) A receiver received Hamming Code 1011011 with even parity. Find error in the received code and give corrected code.

(b) Explain working of 3 bit flash type ADC. Why is it useful in high speed operations ?

(c) What is Karnaugh Map ? Give layout of four variable K-map. Simplify the following Boolean Equation using K-map.

$$Y = \overline{A}BCD + AB\overline{C}\overline{D} + AB\overline{C}D + ABCD + ABC\overline{D} + A\overline{B}\overline{C}D$$
$$+ A\overline{B}CD + A\overline{B}C\overline{D}$$

(d) What do you mean by Multiplexer Tree ? How will you construct 32 : 1 multiplexer using 16 : 1 multiplexer ?

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

(a) (i) Draw internal block diagram of IC 555. Explain how it works as an Astable Multivibrator.

    (ii) With the help of suitable diagram, explain working of 4-bit Universal Adder/Subtractor.

(b) (i) What are the different types of ROM ? Explain working of 'Diode Matrix ROM'.

    (ii) Explain working of JK Flip-Flop with logic diagram and truth table. What is 'Race-around Condition' ? How it can be avoided ?

Total No. of Questions : 5]   [Total No. of Printed Pages : 7

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

STATISTICS

PAPER - I

STATISTICAL METHODS - I

(Old 2004 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)   Explain the terms Class Width and Open End Class.

    (b)   Compute mean and mode of the following data on number of times a batsman got out on zero in a year for 10 batsmen :

        5, 4, 11, 7, 11, 6, 11, 3, 6, 11.

    (c)   Coefficients of variation of two groups of observations are 30% and 40% respectively and their standard deviations are 12 and 20. Find their arithmetic means.

    (d)   If $\beta_1 = 1.125$ and $\mu_2 = 2$, find values of μ_1 and μ_3.

[3718]-58   1   P.T.O.

(e) Define Positive Correlation and Negative Correlation with an illustration of each for a Bivariate Data.

(f) State expressions for regression coefficients in a Bivariate Data. Also, state relationship between Karl Pearson's Coefficient of Correlation and Regression Coefficients.

(g) Compute value of $r_{13.2}$ if $r_{12} = 0.28$, $r_{13} = 0.5$ and $r_{23} = 0.49$.

(h) State four components of Time Series.

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

(a) Explain Concept of Central Tendency of a Data Set. Discuss Median as a Measure of Central Tendency.

(b) For the following frequency distribution, find values of median and upper quartile :

Wages in Rs. per hour	Number of Employees
< 45	14
45 – 47	42
47 – 49	75
49 – 51	18
51 – 53	7
Over 53	4

(c) State any four requisites of a good measure of Central Tendency.

(d) Explain Concept of Weighted Mean. Discuss its utility. The values 3, 5 and 7 are assigned weights of $(a - 4)$, $(a - 2)$ and $(a + 1)$ respectively. If the Weighted mean is 6, find value of a.

(e) The following data shows % of subsidy under different heads. Represent it by a Pie diagram :

Item	% of Subsidy
Food	15
Fertilisers	32
LPG	20
Exports	13
Others	20

(f) The following data represents sales (in Rs. lakhs) of 100 companies :

Sales	No. of Companies
58-60	12
60-62	18
62-64	–
64-66	30
66-68	–
68-70	5

If modal sales is 64.4, find missing frequencies.

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

(a) What are relative measures of Dispersion ? Explain how they are superior to the absolute measures of Dispersion.

(b) For a data set, Arithmetic Mean = 50, Mode = 58 and Standard Deviation = 26 are given. Find –

    (i) Karl Pearson's Co-efficient of Skewness

    (ii) Median

    (iii) Co-efficient of Variation

    (iv) Comment upon type of Skewness

(c) Define r^{th} Order Raw and Central Moments for Grouped Frequency Distribution. How are central moments useful in calculation of Measures of Skewness and Kurtosis ?

(d) Consider the following results on runs scored by players A and B :

	Player A	Player B
No. of Test Maches	5	7
Arithmetic Mean	55	45
Standard Deviation	40	15

    (i) Which player has scored more number of runs ?

    (ii) Which player is more consistent in batting performance ? Justify your answer.

(e) Define Skewness. Draw different sketches to indicate different types of Skewness. Which measure of skewness is suitable for frequency distribution with Open End Class.

(f) The variance of a distribution is 2. What should be the value of Fourth Central Moment so that the distribution is :

    (i) mesokurtic

    (ii) platykurtic

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

(a) (i) What is Scatter Diagram ? Discuss how it is useful in deciding correlation between two variables in a bivariate data.

(ii) Compute Correlation Coefficient between X and Y for the following data :

X	13	21	29	37	45
Y	5	9	13	17	21

(b) (i) Write stepwise procedure to obtain equation of line of regression of X on Y for a bivariate data.

(ii) In the regression analysis, the equations of two lines of regression are $2Y - X = 50$ and $3Y - 2X - 10 = 0$. Find means of X and Y. Also find coefficient of correlation between X and X.

(c) (i) Explain similarities and differences between Correlation and Regression.

(ii) A set of 10 observations has the sum of squares of deviations from the mean equal to 120. Find its variance. If two more values, each equal to the mean are added, what will be the variance of the new set ?

(d) Fit an equation of the form $y = ab^x$ to the following data :

x	2	3	4	5	6
y	8.3	15.4	33.1	65.2	127.4

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

   (a)   (i)   What is Time Series ? Explain how Time Series Analysis can be considered as a special case of Bivariate Regression Analysis ?

          (ii)   Compute $R_{1.23}$ and $r_{13.2}$ for the following data :

$$r_{12} = 0.65 \qquad r_{13} = 0.6 \qquad r_{23} = 0.9$$

   (b)   (i)   State Additive and Multiplicative Models of a Time Series. Explain seasonal variation as a component of Time Series.

          (ii)   Compute three-yearly moving averages for the following data on annual sales in Rs. thousands :

Year	Sales
1991	242
1992	238
1993	252
1994	257
1995	250
1996	273
1997	270
1998	268
1999	288

   (c)   (i)   Describe stepwise procedure for fitting curve of the type $y = a + bx + cx^2$ for a bivariate data.

          (ii)   For a bivariate data on (x, y), $\bar{x} = 53$, $\bar{y} = 28$, $b_{yx} = -1.5$, $b_{xy} = -0.2$, find correlation coefficient between x and y. Estimate value of y when x = 60. Also estimate value of x when y = 30.

(d) (i) Describe procedure to locate mode for a grouped frequency distribution using a suitable graph.

(ii) Find equation of plane of regression of x_1 on x_2 and x_3 for the following data where variables are measured from their respective means :

$\sigma_1 = 10$, $\sigma_2 = 8$, $\sigma_3 = 5$

$r_{12} = 0.8$, $r_{13} = 0.6$, $r_{23} = 0.5$

[3718]-59

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

STATISTICS

PAPER - II

STATISTICAL METHODS - II

(Old 2004 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 meaning unless otherwise stated.

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

(a)   If A and B are independent events with P(A) = 0.5, P(B) = 0.4, find $P(A \cup B)$, $P(A/B)$.

(b)   Define Exhaustive Events with an example.

(c)   If $E(x) = 5$, $Var(x) = 5$, $Y = \dfrac{x - 5}{5}$,

find $E(Y)$ and $Var(Y)$.

(d)   State additive property of the Binomial Distribution.

(e)   Find n and r, if

$^{n}P_{r} = 60$ and $^{n}C_{r} = 10$.

(f)   State conditions under which a continuous function becomes a valid p.d.f.

(g)   Let $x \to N(0, 1)$. Find $P(x > 0)$ and $P(0 < x < 1)$.

(h)   Distinguish between Type-I Error and Type-II Error.

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

(a) Define each of the following :

(i) Random Experiment

(ii) Event

(iii) Equiprobable Sample Space

(iv) Impossible Event

(b) A problem in statistics is given to three students A, B and C whose chances of solving it are $\frac{1}{2}, \frac{3}{4}, \frac{1}{4}$ respectively. What is the probability that the problem will be solved.

(c) Prove the following :

(i) For any event A, defined on sample space Ω, $0 \le P(A) \le 1$.

(ii) If A′ is the complement of A with respect to sample space Ω, then $P(A') = 1 - P(A)$.

(d) In a single throw of two dice, find

(i) P[odd number on first die and 6 on the second die],

(ii) P[a number greater than 4 on each die],

(iii) P[total greater than 8].

(e) Distinguish between Mutually Exclusive Events and Independent Events, with the help of examples.

(f) Let Ω = {a, b, c, d, e, f}.

A function P on Ω defines a probability model by assigning probabilities in the following manner :

Elements	a	b	c	d	e	f
Probability	0.1	0.2	0.1	0.2	0.1	0.3

Determine conditional probability of

(i) {a, b, c} given {b, c, d, f}

(ii) {d, e, f} given {a, b, c}

2

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

(a) Define distribution function of a discrete random variable. Also state its important properties.

(b) Consider the following probability distribution of a discrete random variable X :

X	0	1	2	3	4
P[X = x]	0.1	0.2	0.4	0.2	0.1

Find probability distribution of $y = x^2 + 3$. Also find mean and variance of y.

(c) Define Poisson Distribution. State recurrence relation between the probabilities of Poisson Distribution. Under what conditions binomial distribution can be approximated by Poisson Distribution.

(d) In a certain region the probability that it rains on any given day is 0.5. Use binomial distribution to evaluate probability that in seven days chosen at random, it rains on atmost two days.

(e) Define Binomial Distribution. State its Mean and Variance. Give one real life situation in which the Binomial Distribution can be used.

(f) The average number of misprints per page of a book is 3. Assuming Poisson Distribution, what is the probability that a particular page is free from misprints ? If the book contains 1,000 pages, how many of the pages contain more than 2 misprints ?

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

(a) (i) Suppose $X \rightarrow U[10, 30]$. Find mean, variance, $P[X > 20]$, $P[X > 25 / X > 20]$.

(ii) The time [in hours], that a computer functions before breaking down is a continuous random variable with p.d.f. given by

$$f(x) = \begin{cases} \lambda e^{-x/1000} & x \geq 0 \\ 0 & o.w. \end{cases}$$

Find value of 'λ' and $E(x)$.
Also find probability that a computer will function between 500 and 600 hours before breaking down.

(b) (i) Let X be a continuous random variable having normal distribution with parameters μ and σ^2. State p.d.f. of X. If Y = ax + b, where a and b are constants, identify distribution of Y. Also state expressions for Mean and Variance of Y.

(ii) In a certain examination, mean of marks scored by 1000 students is 50 with standard deviation 20. Assuming the distribution to be normal, find number of students securing marks between 40 and 60. Also find lower quartile of the distribution.

(c) (i) Define Exponential Distribution. State and interpret lack of memory property of the exponential distribution. Also give one real life situation where exponential distribution can be used.

(ii) 3% of the electric bulbs manufactured by a company are defective. Using normal approximation find probability that in a sample of 500 bulbs, 20 or more will be defective. Also find probability that the number of defectives will lie between 10 and 20.

(d) (i) Define each of the following :
(1) Parameter
(2) Statistic
(3) Null Hypothesis
(4) Critical Region

(ii) A coin is tossed 500 times and it turned up 260 times head. Can the coin be regarded as fair ? Use 5% level of significance.

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

(a) (i) Explain step-wise test procedure for testing hypothesis $H_0 : \mu = \mu_0$ against $H_1 : \mu \neq \mu_0$ for a large sample, at $\alpha\%$ level of significance.

(ii) 60 children were asked which flavour of ice-cream they liked out of vanilla, strawberry and chocolate. The answers recorded are as follows :

Flavour	Vanilla	Strawberry	Chocolate
Number	17	24	19

Test if there is any difference among the tastes of the children as far as ice-cream flavours are concerned. Use 5% l.o.s.

(b) (i) Certain pesticide is packed into bags by a machine. A random sample of 10 bags is drawn and their weights (in kg) are found as follows :

50, 49, 52, 44, 45, 48, 46, 45, 49, 45.

Test if the average weight of a bag can be taken as 50 kg ? Use 5% l.o.s.

(ii) The following is a 2 × 2 contingency table :

Eye Colour in Father	Eye Colour in Son	
	Not Light	Light
Not Light	23	15
Light	15	47

Test whether eye colour of son is associated with eye colour of father. Use 1% l.o.s.

(c) (i) State advantages and disadvantages of Simulation.

(ii) In an industrial production line, items are inspected periodically for defectives. The following is a sequence of defective items D, and non-defective items N, produced by this production line :

N N D D D N D D N N N N D D D N N D N D

Use run test with a significance level 5% to determine whether the defectives are occuring at random or not.

(d) (i) Define a discrete uniform distribution. State its mean and variance. Give one real life situation in which the distribution can be used.

(ii) Consider the following probability distribution of X :

X	1	2	3	4	5
P[X = x]	k	k	2k	3k	5k

Find value of k, also find P[X is odd], further find distribution function of X.

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Total No. of Questions : 5]   [Total No. of Printed Pages : 3

[3718]-6

F. Y. B. Sc. (Computer Science) Examination - 2010
ELECTRONICS
PAPER - II
FUNDAMENTALS OF DIGITAL ELECTRONICS
(New 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 diagrams wherever necessary.

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

   (a)   What are the types of Parity ? What is the purpose of adding parity bit to data bits ?

   (b)   Draw symbol and write truth table of Universal Gates.

   (c)   Draw logic circuit of Half Subtracter.

   (d)   Give one example each of Combinational Circuit and Sequential Circuit.

   (e)   Draw circuit for generating Clock using Crystal.

   (f)   Write full form of EPROM and EEPROM.

   (g)   Define the terms :

       Monotonicity of DAC and Quantization Error of ADC.

   (h)   What is the function of Assembler ?

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

   (a) Convert binary number 1111 1111 to :

      (i) Decimal

      (ii) Hexadecimal

      (iii) Octal

      (iv) Gray

   (b) Write a short note on Server and Super Computer.

   (c) With logic diagram, explain working of Parallel Adder.

   (d) Draw logic symbols for level triggered and edge triggered SR Flip Flops.

   (e) Classify memory based on :

      (i) Physical Characteristics

      (ii) Fabrication Technology

      (iii) Mode of Access

      (iv) Principle of Read/Write Operation

   (f) Draw circuit diagram of 4 bit R-2R DAC. Find Full Scale Output Voltage if V_{ref} = 10V.

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

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

   (b) With circuit diagram, explain Operation of Diode Matrix ROM.

   (c) Draw circuit diagram of Monostable Multivibrator using IC 555. Find pulse width generated if R = 10kΩ and C = 0.1μF.

   (d) Draw circuit diagram of TTL NAND Gate. What is meant by the terms - Fan Out and Propagation Delay ?

   (e) With logic diagram, explain working of 4 bit Ring Counter.

   (f) Draw logic diagram and write truth table of 1 of 10 Decoder.

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

    (a)   Draw and explain working of Dual Shope ADC.

    (b)   Express $(+15)_{10}$ as 8 bit binary and $(-15)_{10}$ as 8 bit binary.

           Find 1's Complement and 2's Complement of $(10)_{10}$.

           Perform subtraction of binary numbers 1011 – 1001 using 2's Complement Method.

    (c)   Differentiate between :

           (i)   RISC and CISC

           (ii) PC System and Embedded System

    (d)   Design sequence generator using flip-flop for the following random sequence :

           $0 \rightarrow 1 \rightarrow 3 \rightarrow 2 \rightarrow 0$

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

    (a)   (i)   Draw and explain operation of 8 : 1 Multiplexer.

               How will you implement function $y = \Sigma m\ (0,\ 2,\ 5,\ 7)$ with this multiplexer ?

           (ii) Draw internal block diagram of IC 555. Explain function of each block.

    (b)   (i)   What is the difference between Synchronous and Asynchronous Counter ? Draw logic diagram of 3 bit asynchronous up counter. Also write its truth table. If a clock with frequency 10 kHz is applied at its input, what will be the frequency at the output of the counter ?

           (ii) Design a circuit to build a memory of capacity $2k \times 8$ using $1k \times 8$ memory chips. Find its memory address map.

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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 calculators and statistical tables is allowed.

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

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

  (a) Calculate Mode and Arithmetic Mean of the following data on number of times a batsmen got out on zero in a year for 12 batsmen :

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

  (b) Explain the following terms :

    (i) Class Width

    (ii) Open End Class

  (c) Coefficients of Variation of two groups of observations are 40% and 50% respectively and their Standard Deviations are 16 and 20. Find their Arithmetic Means.

(d) If $\beta_1 = 0.5$ and $\mu_2 = 2$, find values of μ_1 and μ_3.

(e) Define Positive Correlation and Negative Correlation with an illustration each for a Bivariate Data.

(f) State Expressions for Regression Coefficients in a Bivariate Data. Also, state relationship between Karl Pearson's Coefficient of Correlation and Regression Coefficients.

(g) Calculate value of $r_{12.3}$ when $r_{12} = 0.28$, $r_{13} = 0.5$, $r_{23} = 0.49$.

(h) State four components of Time Series.

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

(a) Explain Concept of Central Tendency of a Data Set. Discuss median as a measure of Central Tendency.

(b) For the following frequency distribution, find median and 8th decile :

Wages in Rs. per hour	No. of Wage Earners
Less than 35	14
35 – 37	62
37 – 39	99
39 – 41	18
41 – 43	7
Over 43	8

(c) State any four requisites of a good measure of Central Tendency.

(d) What is Trimmed Mean ? Discuss its utility. Calculate 20% trimmed mean for a set of ten values :

15, 25, 20, 10, 12, 22, 21, 16, 14, 10.

(e) Write a note on Boxplot.

(f) The following is the distribution of sales in thousand Rs. of shops on a street in a city :

Sales in thousand Rs.	0-10	10-20	20-30	30-40	40 and above
No. of Shops	14	–	27	–	15

If the mode and median of sales are Rs. 24,000 and Rs. 25,000 respectively, find missing frequencies.

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

(a) What are Relative Measures of Dispersion ? Explain how are they superior to the Absolute Measures of Dispersion ?

(b) Given that Arithmetic Mean = 160, Mode = 157, Standard Deviation = 50.

Find :

(i) Karl Pearson's Coefficient of Skewness

(ii) Median

(iii) Coefficient of Variation

(iv) Comment upon type of Skewness

(c) Define r^{th} order raw and central moments for grouped data. How are central moments useful in calculation of measure of Skewness and Kurtosis ?

(d) Particulars regarding the income of two localities are given below :

	Locality X	Locality Y
No. of Persons	600	500
Mean Income	175	186
Variance of Income	100	80

(i) In which locality is the variation in income more ? Justify your answer.

(ii) Find combined standard deviation of the locality X and locality Y put together.

(e) Define Skewness. Draw different sketches to indicate different types of Skewness. Which measure of skewness is suitable for frequency distribution with Open End Class.

(f) The Standard Deviation of a distribution is 2. What should be the value of 4th Central Moment in order that the distribution is :

(i) mesokurtic

(ii) platykurtic

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

(a) (i) What is Scatter Diagram ? Discuss how it is useful in deciding correlation between two variables in a bivariate data.

(ii) Compute coefficient of correlation between X and Y for the following data. Interpret your result.

X	10	13	16	19	22
Y	21	27	33	39	45

(b) (i) Write stepwise procedure to obtain equation of line of regression of X on Y for a bivariate data.

(ii) In regression analysis the equations of two lines of regression are $8X - 10Y + 66 = 0$ and $40X - 18Y = 214$. Find means of X and Y. Also find coefficient of correlation between X and Y.

(c) (i) Discuss Spearman's Rank Correlation for cases with ties and without ties.

(ii) Calculate Rank Correlation Coefficient between X and Y, for the following data. Also interpret the result.

Marks in Maths	Marks in Physics
90	85
30	42
82	75
45	68
32	45
65	63
40	60
88	90
73	62
66	58

(d) Consider the following data :

X	Y
4	8
5	12.5
6	18
7	24.5
8	32

Fit a curve of the type $Y = aX^b$ using least square principle. Also estimate Y when X = 9.

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

(a)   (i)   What is Time Series ? Explain how Time Series Analysis can be considered as a special case of Bivariate Regression Analysis ?

(ii)   Compute $R_{1.23}$ and $r_{13.2}$ for the following data :

$r_{12} = 0.7$, $r_{13} = 0.5$, $r_{23} = 0.5$.

(b)   (i)   Describe procedure to estimate seasonal variations in a time series using ratio to trend method.

(ii)   Estimate trend values using method of five yearly moving average for the following data :

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
No. of Students	33	31	35	39	40	42	41	43	45	49

(c)   A pharmaceutical company employs quality control technique to control concentration of a certain ingredient in their product. Ten samples each of size 3 were taken, which are summerised below :

Sample No.	1	2	3	4	5	6	7	8	9	10
$\overline{X}$	10.2	10.5	10.4	10.3	9.75	10.2	10.2	10.4	10.3	9.75
R	0.45	0.69	0.53	0.15	0.55	0.24	0.11	0.71	0.9	0.55

Can you say that the process is under statistical quality control using $\overline{X}$ and R chart ?

(For n = 3, $A_2 = 1.023$, $D_3 = 0$, $D_4 = 2.575$)

(d) (i) Describe procedure to locate mode for a grouped frequency distribution using a suitable graph.

(ii) Let X_1, X_2 and X_3 be the heights in centimeter of son, his mother and his father measured from their respective means. Find least square equation of plane of regression of X_1 on X_2 and X_3 using the following results :

$\sigma_1 = 2.4$, $\sigma_2 = 2.7$, $\sigma_3 = 2.7$,

$r_{12} = 0.28$, $r_{13} = 0.49$, $r_{23} = 0.51$

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[3718]-8

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 statistical tables is allowed.

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

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

    (a)   Define Exhaustive Events with an example.

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

    (c)   State additive property of the Binomial Distribution.

    (d)   If $P(A) = 0.3$, $P(B) = 0.4$ and $P(A/B) = 0.32$, find $P(A \cup B)$.

    (e)   State conditions under which a continuous function becomes a valid p.d.f.

(f) Identify parameters if f(x) is p.d.f. of Normal Distribution

$$f(x) = c. \exp \left\{ -\frac{1}{24} \left(x^2 + 6x + 9 \right) \right\}, c > 0.$$

(g) If $E(X) = 5$, $Var(X) = 3$, $Y = \dfrac{X - 3}{4}$, find $E(Y)$, $Var(Y)$.

(h) Distinguish between Type I Error and Type II Error.

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

(a) Define each of the following :

    (i) Random Experiment

    (ii) Event

    (iii) Equiprobable Sample Space

    (iv) Impossible Event

(b) Suppose cards numbered one to ten are placed in a hat, mixed up and then one of the cards is drawn.

    (i) What is the probability that it is a prime number ?

    (ii) If we are told that the number on the drawn card is atleast 5, then what is the conditional probability that it is atleast 9 ?

(c) Prove the following :

    (i) For any event A defined on sample space Ω, $0 \le P(A) \le 1$.

    (ii) If A' is the complement of A with respect to sample space Ω, then $P(A') = 1 - P(A)$.

(d) Let $\quad = \{W_1, W_2, W_3\}$ be a sample space associated with a certain experiment. If $P(W_1) = K$, $P(W_2) = 2K^2$, $P(W_3) = K^2 + K$, find K. Also examine whether $A = \{W_1, W_2\}$ and $B = \{W_2, W_3\}$ are independent events.

(e) Distinguish between Mutually Exclusive Events and Independent Events, with the help of examples.

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

    (i) they belong to different suits, and

    (ii) they are a King, a Queen, a Jack and an Ace.

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

(a) Define Distribution Function of a Discrete Random Variable. Also state its important properties.

(b) Consider the following probability distribution of a Discrete Random Variable X :

x_i	0	1	2	3
$p(x_i)$	0.2	0.3	0.4	0.1

Find probability distribution of $Y = X^2 + 2X$. Also find Mean and Variance of Y.

(c) Define Poisson Distribution. State recurrence relation between the probabilities of Poisson Distribution. Under what conditions binomial distribution can be approximated by Poisson Distribution ?

(d) Over a long period of time it has been observed that a given marksman can hit a target on a single trial with probability equal to 0.8. Suppose he fires four shots at the target.

    (i) What is the probability that he will hit target exactly two times ?

    (ii) What is the probability that he will hit target atleast once ?

(e) Define Geometric Distribution. State its Mean and Variance. Give one real life situation in which the geometric distribution can be used.

(f) The average number of misprints per page of a book is 2. Assuming Poisson Distribution, what is the probability that a particular page is free from typing misprints ? If the book contains 1,000 pages, how many of the pages contain more than 2 misprints ?

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

  (a) (i) Suppose $X \sim V [2, 25]$. Find Mean, Variance, $P(X < 7.8)$, $P(X < 11 \mid X < 19)$.

      (ii) Let the duration of time (in min.) that a certain lady speaks on the telephone is found to be random variable with a p.d.f. f(x) as $f(x) = Ae^{-x/5}$, for $x \geq 0$

$$= 0 \quad , \text{ o.w.}$$

Find value of A and $E(X)$. Also find probability that the number of minutes that she talks over a phone would be between 5 and 10.

(b) (i) Let X be a continuous random variable having normal distribution with parameters μ and σ^2. State p.d.f. of X. If Y = aX + b, where a and b are constants, identify distribution of Y. Also state expressions for mean and variance of Y.

(ii) In a certain examination, mean of marks scored by 400 students is 45 with standard deviation 15. Assuming the distribution to be normal, find number of students securing marks between 30 and 60. Also find upper quartile of the distribution.

(c) (i) Define Exponential Distribution. State and interpret lack of memory property of the exponential distribution. Also give one real life situation where exponential distribution can be used.

(ii) 5% of the electric bulbs manufactured by a company are defective. Using normal approximation find probability that in a sample of 400 bulbs, 30 or more will be defective. Also find probability that the number of defectives will lie between 10 and 20.

(d) (i) Define each of the following :

(1) Parameter

(2) Statistic

(3) Null Hypothesis

(4) P-value

(ii) A sample of 400 male students is found to have mean weight of 50.47 kg. Can it be regarded as a sample from a large population with mean weight 52 kg. given that population standard deviation is 1.2 kg ? Take $\alpha = 0.05$.

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

(a) (i) Describe step-wise test procedure for testing hypothesis $H_0 : P_1 = P_2$ against $H_1 : P_1 \neq P_2$, for a large sample, at $\alpha\%$ l.o.s.

(ii) Poisson Distribution was fitted by estimating the value of the parameter 'λ', using given data and following results were obtained :

x	0	1	2	3
Observed Frequency	104	65	22	9
Expected Frequency	108.76	62.28	20.22	8.74

Test goodness of fit at 5% l.o.s.

(b) (i) Describe test procedure for testing $H_0 : \mu_1 = \mu_2$ against $H_1 : \mu_1 \neq \mu_2$, at $\alpha\%$ l.o.s. and sample size less than 30.

(ii) With the help of the following data find out whether there is any relationship between smoking and drinking habits. Use 1% l.o.s.

	Drinking	Non-drinking
Smoking	64	36
Non-smoking	20	20

(c) (i) State advantages and disadvantages of Simulation.

(ii) Twenty students were asked to give their opinion on discarding or continuing the system of midterm examination, the following is the sequence of answers

FAFFAAFFFAFAAFAFFAFF

Where F : Favoured Discarding and A : Against Discarding. Use run test to test randomness of opinions. Use 5% l.o.s.

(d) (i) Define Pareto Distribution. Define its Mean and Variance. Also state one real life situation where Pareto Distribution can be used.

(ii) The distribution of X is

$$F(x) = \begin{cases} 0 & , \quad x < -11 \\ \dfrac{x^3 + 1}{9} & , \quad -1 \leq x \leq 2 \\ 1 & , \quad x > 2 \end{cases}$$

Evaluate $P(0 < x \leq 1)$. Also obtain p.d.f. of X.

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