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[4718]-1

F.Y. B.Sc. (Computer Science) EXAMINATION, 2015
INTRODUCTION TO PROGRAMMING AND 'C' PROGRAMMING
(2008 PATTERN)

Time : Three Hours

Maximum Marks : 80

N.B. :— (i) *All* questions are compulsory.

(ii) Figures to the right indicate full marks.

(iii) Neat diagrams must be drawn wherever necessary.

1. Answer the following :

[10×1=10]

(a) Explain conditional operator.

(b) Write any *two* advantages of 'C'.

(c) Evaluate the following 'C' expression

$\text{ans} = 25/4 + 3 - 7\% 3 + 2$

What will be the value of ans ?

(d) The default case in 'switch' statement must be at the end.
Comment.

(e) Define scope of a variable.

(f) Write syntax for declaring Void Pointer.

(g) What is use of atoi() function ?

(h) What is size of the following union ?

```
union xyz
{
    int x[20];
    char s[20];
}
```

(i) Define Preprocessor.

(j) What is use of gets() function ?

P.T.O.

2. Answer the following (any *four*) : [4×5=20]

- (a) Differentiate between While and Do-while loops.
- (b) Explain various operations possible on pointers.
- (c) Explain row major and column major representation for arrays with example.
- (d) Differentiate between compiler and interpreter.
- (e) Explain increment and decrement operators with example.

3. Answer the following (any *four*) : [4×5=20]

- (a) Write Algorithm and draw flowchart to find largest of 'n' numbers.

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

```
main()
{
    int p[6] = {1, 2, 3, 4, 5, 6};
    int *ptr = p;
    printf("%d", *(p + 4));
    printf("%d", p[2]);
    printf("%d", *ptr);
}
```

- (c) Find and justify output of the following :

```
main()
{
    int m[5] = {10, 20};
    int i, ans = 0;
    for (i = 0; i < 5; i++)
    {
        ans = ans + m[i];
        printf("%d\n", ans);
    }
}
```

- (d) Find and justify output of the following :

```
main()
{
    int x = 50;
    int y = 100;
    {
        int x = 20;
        int z = x + y;
        printf ("%d\n", z);
    }
    printf("%d\n%d", x, y);
}
```

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

```
main()
{
    int incr(int);
    int x = 1; ans = 0, i;
    for (i = 0; i < 3; i++)
    {
        ans = ans + incr (x);
    }
    printf("%d", ans);
}
int incr(int x)
{
    return (x + 1);
}
```

4. Answer the following (any *four*) : [4×5=20]

(a) Write a 'C' program to check whether a given number is palindrome or not.

[Palindrome is a number whose reverse and the original number is same].

(b) Write a 'C' program to accept 'n' elements into a 2-D Array using Dynamic Memory Allocation. Find the sum of element of the array.

(c) Write 'C' program to copy one string to another without using standard library function such that the cases of the characters are inverted.

[e.g. Delhi o/p dE|hI]

(d) Write 'C' program to create a new file and accept data from user and save it in file. Display the count of total number of characters from file.

(e) Write a 'C' program to find x raise to y using recursive function.

5. Answer the following (any *two*) : [2×5=10]

(a) Write a note of basic structure of 'C' program.

(b) Differentiate between auto and static storage classes.

(c) Explain Macro preprocessor directives with suitable example.

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[4718]-1001

S.Y. B.Sc. (Computer Science) EXAMINATION, 2015

COMPUTER SCIENCE

Paper I

(CS-101 : Problem Solving Using Computer and

‘C’ Programming)

(2013 PATTERN)

Time : Three Hours

Maximum Marks : 80

N.B. :— (i) *All* questions are compulsory.

(ii) Figures to the right indicate full marks.

(iii) Neat diagrams must be drawn wherever necessary.

1. Answer all the following : [10×1=10]

- (a) Define Algorithm.
- (b) What is source code ?
- (c) Who developed C language ?
- (d) What is a token ?
- (e) Explain conditional operator ?
- (f) What is the use of `getchar()` and `putchar()` function in ‘C’ ?
- (g) What are the types of scope of a variable ?
- (h) State the use of `ftell()` function.
- (i) Define Preprocessor.
- (j) What is a string ?

P.T.O.

2. Answer the following (any *four*) : [4×5=20]

- (i) Write a short note on “User defined data types in C”.
- (ii) Explain Register storage class.
- (iii) Explain structures in ‘C’ ?
- (iv) Differentiate between ‘while’ loop and ‘do while’ loop ?
- (v) Explain the following functions with example :
 - (a) fprintf()
 - (b) fscanf()
 - (c) fread()
 - (d) fwrite()

3. Answer the following (any *four*) : [4×5=20]

- (i) Differentiate between algorithm and flowchart.
- (ii) What will be the output of the following code ? Justify.

```
#include <stdio.h>
```

```
void main()
```

```
{    int i = 3;
```

```
    switch(i)
```

```
    {    case 0 :        printf (" I am here");
        break;
```

```
        case 1 + 0 :    printf ("I am in second case");
        break
```

```
        case 4/2 :      printf ("I am in the third case");
        break
```

```
        case 8% 5 :     printf ("good bye");
        break
```

```
    }
```

```
}
```

- (iii) What is the O/P of the following 'C' code ? Justify.

```
#include <stdio.h>

void main()
{
    char*S = "hello";
    char*P = S;
    printf ("%c\t%c",*(p + 3), s[1]);
}
```

- (iv) What is the output of this C code ? Justify.

```
#include <stdio.h>

int main()
{
    int a = 1, b = 1, c;
    c = a++ + b;
    printf ("%d, %d", a, b);
}
```

- (v) Write a function to calculate the length of a string. (Don't use std. library functions).

4. Answer the following (any *four*) : [4×5=20]

- (i) Write a 'C' program to accept n numbers and sort them in descending order.
- (ii) Write a 'C' program to copy the contents of one file to another file. The file names are passed using command line arguments.
- (iii) Write a 'C' program to reverse the digits of a number.

(iv) Write a 'C' program to accept $m \times n$ matrix and generate a $(m + 1) \times (n + 1)$ matrix such that the $m + 1$ th row contains sum of elements of corresponding columns and $n + 1$ th column contains sum of elements of corresponding rows.

(v) Write a 'C' program to accept n names and display them and search for a particular name.

5. Answer the following (any *two*) : [2×5=10]

- (i) Differentiate between a function and macro.
- (ii) Explain 'break' and 'continue' statement with an example.
- (iii) Explain recursion with an example.

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[4718]-1002

F.Y. B.Sc. (Computer Science) EXAMINATION, 2015

COMPUTER SCIENCE

Paper II

(CS-102 : File Organization and Fundamentals of Databases)

(2013 PATTERN)

Time : Three Hours

Maximum Marks : 80

N.B. :— (i) *All* questions are compulsory.

(ii) Figures to the right indicate full marks.

(iii) Neat diagrams must be drawn wherever necessary.

(iv) Assume suitable data if necessary.

1. Attempt *all* of the following : [10×1=10]

(a) What is the basic structure of SQL ?

(b) Define Super Key.

(c) What are the levels of abstraction of a database schema ?

(d) Give different operations performed on a file.

(e) What is the difference between char and varchar ?

P.T.O.

- (f) Define second normal form.
- (g) State the different types of outer join operations.
- (h) What is the referential integrity constraint ?
- (i) Define an Attribute.
- (j) Give any *two* disadvantages of traditional file system.

2. Answer any *four* of the following : [4×5=20]

- (a) What are the desirable properties of decomposition ? Explain in brief.
- (b) Explain various types of users in DBMS.
- (c) What are the different types of file organizations ? Explain any *two* in detail.
- (d) What is generalization ? Explain with an example.
- (e) What are key constraints ?

3. Answer any *four* of the following : [4×5=20]

- (a) Explain single valued and multivalued attributes with examples.

(b) What are the anomalies that might arise if we have redundant data ?

(c) Consider the relation $R(B, C, D, E, F, G)$

and the set of FD's

$$F = \{B \rightarrow C, DE \rightarrow G, B \rightarrow D, DE \rightarrow F, C \rightarrow F\}$$

Compute $(BE)^+$.

(d) What is data independence ? Explain the *two* types of data independence in brief.

(e) State and explain different types of relationships that can exist in an entity set in an ER Model.

4. (A) Answer any *three* of the following : [3×5=15]

(a) Consider the following relations :

Machine (m_no, m_name, m_type, M_cost)

Part (P_no, P-name, P-description)

Machine and part are related with many to many relationship.

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

(i) List all the machines having the part 'register'.

(ii) Find the machines having more than 5 parts.

(iii) Increase the cost of all machines by 10%.

(b) Consider the following relations :

Person (P_no, name, address)

Car (C_no, year, model)

Person and car are related with one to many relationship.

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

(i) List the names of all people who own a 'Indica'.

(ii) Delete all the details of the person 'Mr. Joshi'.

(iii) Find the name of the person who owns maximum no. of cars.

(c) Consider the following relations :

Supplier (S_id, sname, address)

Parts (P_id, Pname, Colour)

Supplier and parts are related with many to many relationship with the descriptive attribute cost. Create a relational database in 3NF and solve the following queries in SQL :

- (i) Find the names of suppliers who supply parts which are blue or pink in colour.
- (ii) Find total cost of all parts supplied by 'Shree Agencies'.
- (iii) Find the names and addresses of all suppliers who are supplying the item 'Bath towel'.

(d) Consider the following relations :

Musician (m_no, m_name, age, city)

Instrument (i_no, i_name)

Musician and instrument are related with a many to many relationship. Create a relational database in 3NF and solve the following queries in SQL :

- (i) List all the 'tabala' players.
- (ii) Find all the musicians who study in Pune and play 'flute'.
- (iii) List all the instruments that are played by more than 3 musicians.

(B) Attempt any *one* of the following : [1×5=5]

- (a) Consider the following relations :

Property (P_no, description, location, area)

Owner (O_no, name, address, phone)

Lrop-Own (O_no, P_no, cost)

Solve the following queries in relational algebra :

- (i) Find all properties from the 'Hadapsar' Location.
- (ii) List all the properties owned by 'Mr. Reddy'.

- (iii) Give the cost of all properties located in 'Kothrud'.
- (iv) Find the names of the owners of the property 'Shaniwar Wada'.
- (v) List all properties having area > 3,000 sq. ft.

(b) Consider the following relations :

Food (F_id, name, description)

Ingredient (i_id, name, type)

F_ing (F_id, i_id, quantity)

Solve the following queries in relational algebra :

- (i) Give all the ingredients of 'Mango Barfi'.
- (ii) Find all the food items having at least one ingredient of the type 'non-veg'.
- (iii) Find all food products having description 'Sugar free'.
- (iv) List all the ingredients along with quantity used in the food item 'Gulabjamuns'.
- (v) Find all food items that require more than 1 kg of sugar.

5. (A) A sports institute wants to maintain records of all its sports teams. For each team, the information regarding players in that team is to be maintained. Each player can be a part of more than one team. The details of all matches played and the scores of the teams in each match are to be recorded.

(i) Design an E-R diagram for above scenario, assume attributes if necessary.

(ii) Convert the E-R diagram into a relational database in 3NF. [7]

(B) What is DML ? Explain procedural and non-procedural DML. [3]

Or

Explain Ternary Relationship with examples. [3]

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F.Y. B.Sc. (Com. Sci.) EXAMINATION, 2015

MATHEMATICS

Paper I

(MTC-101-Discrete Mathematics)

(2013 PATTERN)

Time : Three Hours

Maximum Marks : 80

N.B. :— (i) *All* questions are compulsory.

(ii) Figures to the right indicate full marks.

(iii) Neat diagrams must be drawn wherever necessary.

1. Attempt any *eight* of the following : [16]

(i) Draw Hasse diagram for the relation ‘divides’ on the set $\{1, 2, 3, 4, 6, 12\}$.

(ii) Write the following statement in symbolic form using quantifiers and hence write its negation :

‘Every F.Y. B.Sc. (Com. Sci.) student studies Discrete Mathematics’

P.T.O.

(iii) How many arrangements of the letters of the word 'ACCEPTANCE' are there ?

(iv) State first principle of Mathematical Induction.

(v) Find first four terms of the sequence defined by the following recurrence relation :

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

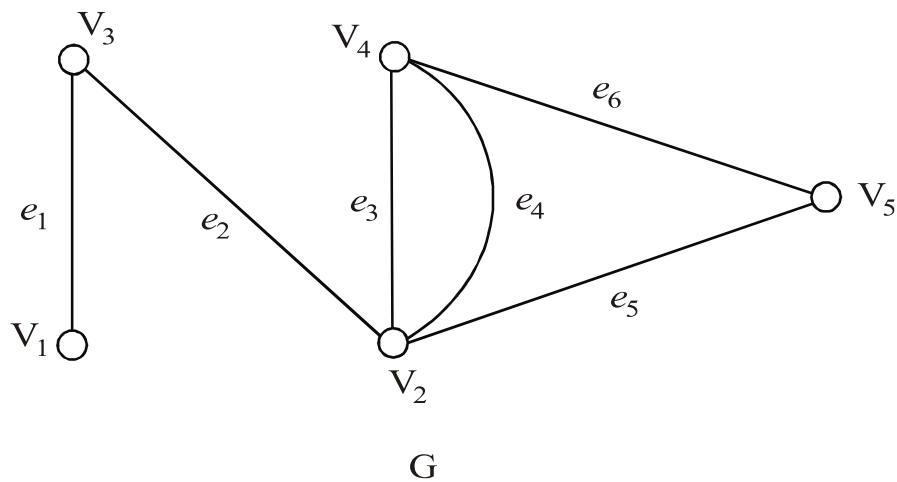
(vi) Define :

(a) A regular graph

(b) Balanced digraph.

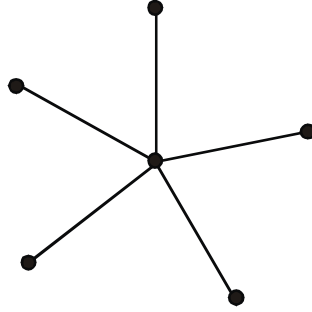
Give *one* example of each.

(vii) Draw the graph $G - \{V_2\}$ for the following graph G .



(viii) Draw complete graph on 5 vertices. Also find its vertex connectivity.

(ix) Find complement of the following graph :



(x) Does there exist a binary tree on 11 vertices with only 4 pendant vertices ? Justify your answer.

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

(i) Check the following logical equivalence using truth table :

$$[a \rightarrow (a \wedge c)] \equiv [(a \rightarrow b) \wedge (a \rightarrow c)]$$

(ii) Solve the following recurrence relation :

$$a_n - 7a_{n-1} + 10a_{n-2} = 0$$

$$a_0 = 1, a_1 = 2$$

(iii) How many *four* digit numbers are there that begin with 3 or end with 3 ?

(iv) Draw Hasse diagram of Lattice D_{20} . Is it a complemented lattice ? Justify.

(v) Show that if 21 integers are chosen from the numbers 1 to 40, then there is one integer which divides the other.

(vi) Using combinatorial argument prove that :

$$2^n = \binom{n}{0} + \binom{n}{1} + \dots + \binom{n}{n}$$

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

(i) (a) Write the following argument in symbolic form and check the validity “If Ravi knows Pascal, then he passes the examination. Ravi knows Java. If Ravi knows Java, then he is selected for campus interview. Either he is not selected for campus interview or he does not pass the examination. Therefore Ravi does not know pascal.” (p, q, r, s)

(b) Convert the following statement in symbolic form and hence write its converse and contrapositive.

‘If I am not President of India then I will walk to work’.

(p, w)

(ii) Write the Boolean expression

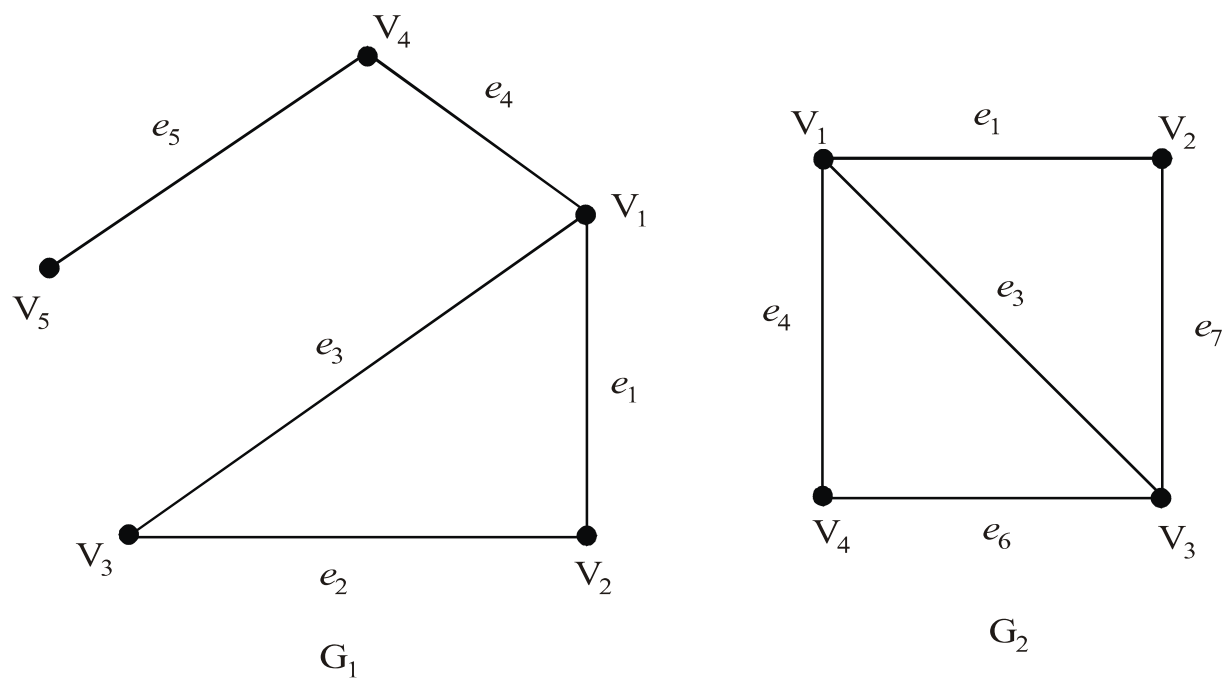
$$f(x, y, z) = y \cdot \overline{(x + z)} + (x \cdot y + \bar{z} \cdot x)$$

in disjunctive normal form.

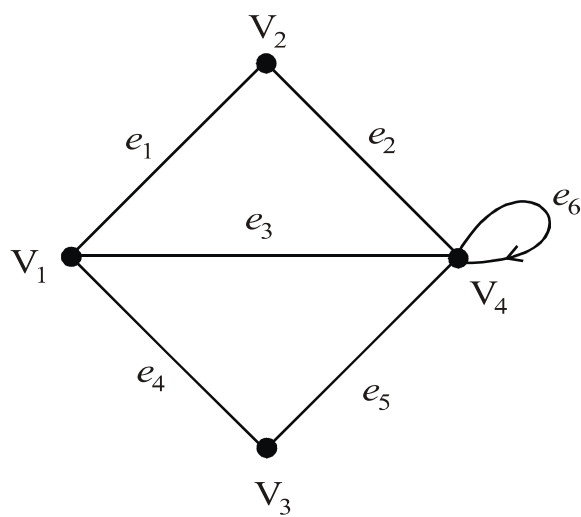
(iii) How many integers from 1 to 195 are relatively coprime to 195.

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

(i) Find $G_1 \cup G_2$ and $G_1 \cap G_2$ for the following graphs :



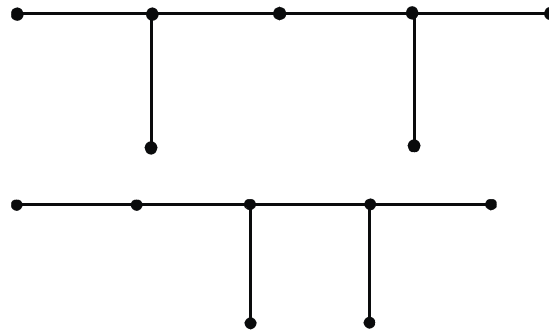
(ii) (a) Write incidence matrix I (4) for the following graph :



(b) Draw the graph whose adjacency matrix is :

$$\begin{bmatrix} 0 & 1 & 2 & 1 \\ 1 & 0 & 1 & 0 \\ 2 & 1 & 1 & 2 \\ 1 & 0 & 2 & 0 \end{bmatrix}$$

(iii) Are the following *two* graphs isomorphic ? Justify your answer.

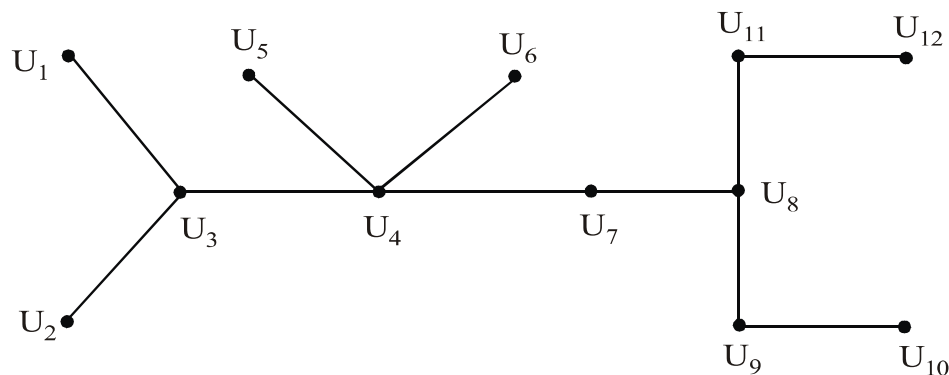


(iv) Draw the arborescence and hence write the following algebraic expression in Polish notation (in fix notation) :

$$\frac{(x + y)}{5} + (x - y)^3.$$

Or

(v) Find eccentricities of all vertices of the following graph and hence find its centre and radius.

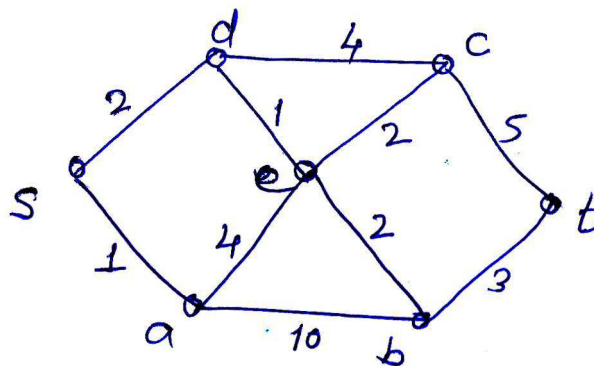


(vi) Prove that a tree on n vertices has $(n - 1)$ edges.

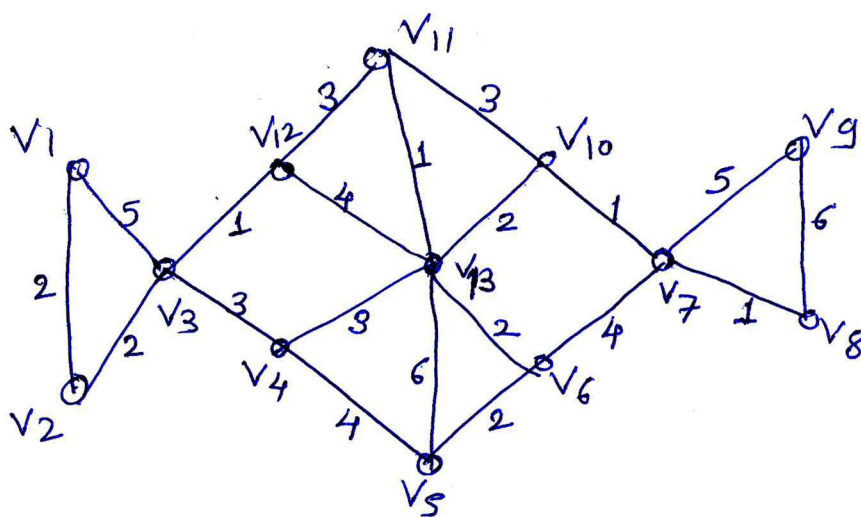
5. Attempt any *two* of the following :

[16]

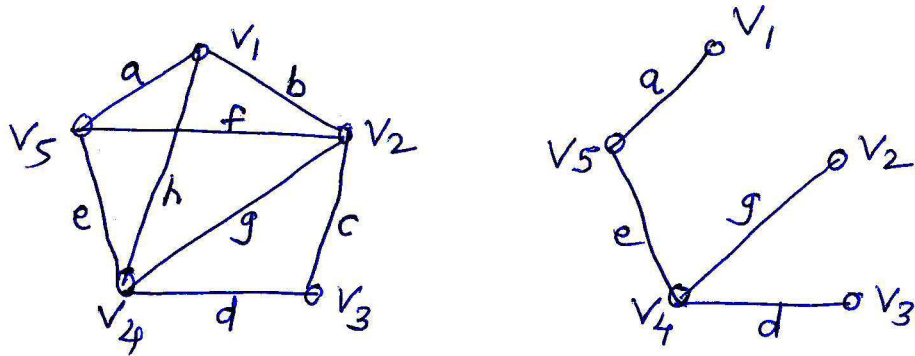
- (i) Use Dijkstra's algorithm to find a shortest path from a vertex s to vertex t in the following weighted graph :



- (ii) Use Kruskal's algorithm to find a minimal spanning tree of the following weighted graph :



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



Find all fundamental cutsets and fundamental circuits of G w.r.t. T .

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[4718]-1004

F.Y. B.Sc. (Computer Science) EXAMINATION, 2015

MATHEMATICS

Paper II

(MTC-102 : Algebra and Calculus)

(2013 PATTERN)

Time : Three Hours

Maximum Marks : 80

N.B. :— (i) All questions are compulsory.

(ii) Figures to the right indicate full marks.

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

(iv) Use of non-programmable battery calculator is allowed.

1. Attempt any *eight* out of ten : [8×2=16]

(1) Let $A = \{x, y, z\}$

If matrix of relation R ,

$$M(R) = \begin{bmatrix} 0 & 1 & 1 \\ 1 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix},$$

write down relation R .

(2) Define : Semigroup. Give *one* example.

(3) If $a|b$ prove that $a|bc$ for any integer C .

(4) Write addition table for $(\mathbf{Z}_3, +_3)$

(5) Let $f : \mathbf{R} \rightarrow \mathbf{R}$ s.t. $f(x) = x^2 - 1$,

$$\text{Let } g : \mathbf{R} \rightarrow \mathbf{R} \text{ s.t. } g(x) = \frac{3x - 4}{10},$$

Find $f \circ g(x)$.

P.T.O.

- (6) Find value of α if function is continuous in $(-2, 1)$
- $$f(x) = 4x + 5 \text{ if } -2 < x < 0$$
- $$= 2x + \alpha \text{ if } 0 \leq x < 1.$$
- (7) If $y = e^{\alpha x}$, find $y_n = n$ th derivative of y .
- (8) State Taylor's theorem with Lagrange's form of remainder.
- (9) Is the following matrix in reduced row echelon form ?
Justify :

$$A = \begin{bmatrix} 1 & -2 & 3 \\ 0 & 1 & 2 \\ 0 & 0 & 1 \end{bmatrix}.$$

- (10) Define elementary matrix.
2. Attempt any *four* out of six : [4×4=16]
- (1) Find g.c.d. (greatest common divisor) of 2210 and 357. Express g.c.d. in the form $2210m + 357n$.
- (2) Let R be relation defined on set of integers. xRy if and only if $3x + 4y$ is divisible by 7. Show that R is an equivalence relation.
- (3) Prove that $a \equiv b \pmod{n}$ if and only if a and b have same remainder r , $0 \leq r < n$ when divided by n .
- (4) Show that \sqrt{p} is irrational for any prime P.
- (5) Obtain remainder when 5^{147} is divisible by 7.
- (6) If σ is permutation on $A = \{1, 2, 3, 4, 5, 6\}$ defined by

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

write σ as product of transpositions. Find order of σ . Find σ^{-1} .

3. Attempt any *two* out of three : [2×8=16]

(1) Let a_n be the recursive relation defined by

$$a_n = a_{n-1} + a_{n-2} + a_{n-3}, \quad n \geq 3$$

with initial conditions :

$$a_0 = 1, \quad a_1 = 1, \quad a_2 = 1$$

(a) Obtain first few terms of recursive relation.

(b) Prove that all a_n 's are odd.

(c) Prove that $a_n \leq 2^{n-1} \quad \forall \quad n \geq 1$.

(2) Let $Q_1 = Q - \{1\}$. Define $*$ on Q_1 as $a * b = a + b - ab \quad \forall \quad a, b \in Q_1$. Prove that $(Q_1, *)$ is an abelian group.

(3) Let R be an equivalence relation on a set A . Prove that any two equivalence classes are either disjoint or identical. Also prove that if $a, b \in A$, then $b \in [a]$ iff $[a] = [b]$.

4. Attempt any *four* out of six : [4×4=16]

(1) Evaluate :

$$\lim_{x \rightarrow 0} \frac{a^x - 1}{b^x - 1}.$$

(2) Assuming validity of expansion prove that :

$$e^x \cos x = 1 + x - \frac{x^3}{3} - \frac{x^4}{6} - \frac{x^5}{30} \dots$$

(3) In Cauchy's mean value theorem if $f(x) = e^x$ and $g(x) = e^{-x}$. Show that C is the arithmetic mean between a and b .

(4) State and prove Rolle's mean value theorem.

(5) Solve by Gauss elimination method

$$x_1 + x_2 + 2 = 0$$

$$x_2 + x_3 = 1$$

$$x_1 + x_3 = 1.$$

(6) Discuss the continuity of the function $f(x)$ defined by

$$f(x) = \frac{e^{1/x} - e^{-1/x}}{e^{1/x} + e^{-1/x}}, \quad x \neq 0$$

$$= 0 \quad x = 0.$$

5. Attempt any *two* out of three : [2×8=16]

(1) If $a < 1$, $b < 1$ and $a < b$, show that

$$\frac{b-a}{\sqrt{1-a^2}} < \sin^{-1} b - \sin^{-1} a < \frac{b-a}{\sqrt{1-b^2}}.$$

Hence deduce that :

$$\frac{\pi}{6} + \frac{\sqrt{3}}{2} < \sin^{-1} \frac{3}{5} < \frac{\pi}{6} + \frac{1}{8}.$$

(2) Using LU decomposition solve the following system :

$$\begin{bmatrix} 2 & -2 & -2 \\ 0 & -2 & 2 \\ -1 & 5 & 2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} -4 \\ -2 \\ 6 \end{bmatrix}.$$

(3) State and prove Leibnitz's theorem for the n th derivative of product of two functions.

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F.Y. B.Sc. (Computer Science) EXAMINATION, 2015

ELECTRONICS SCIENCE

Paper I

ELC-101 : Principles of Analog Electronics

(2013 PATTERN)

Time : Three Hours

Maximum Marks : 80

N.B. :— (i) All questions are compulsory.

(ii) Neat diagrams must be drawn wherever necessary.

(iii) Figures to the right indicate full marks.

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

(a) Draw the circuit symbols for PNP and NPN transistor.

(b) In a transformer Number of turns in primary $N_P = 100$, Number of turns in secondary $N_S = 200$. If voltage applied to primary $V_P = 200$ V, find secondary voltage V_S .

(c) State Norton's theorem.

(d) Define the term Bandwidth of amplifier.

(e) State Kirchhoff's laws.

(f) Define Intrinsic stand-off ratio for UJT.

(g) Draw the circuit diagram for unity gain amplifier using OP-AMP.

(h) Draw the output characteristics of transistor in CE configuration.

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

(a) Write in detail classification of resistors.

(b) Explain the term RC time constant for charging and discharging of capacitor.

(c) Explain the following terms for Regulated Power Supply :

(i) Line Regulation.

(ii) Load Regulation.

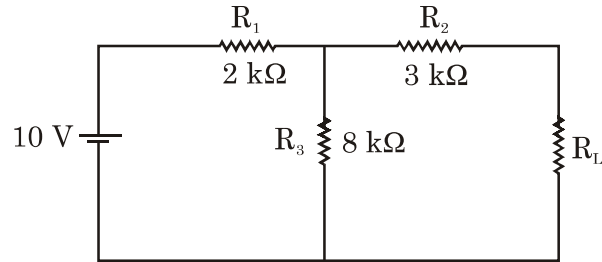
(d) Differentiate between CB, CC and CE configuration of transistor.

P.T.O.

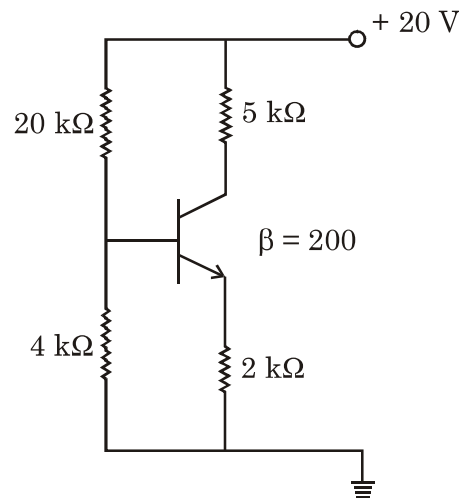
- (e) Explain JFET as voltage variable resistor.
- (f) With a neat circuit diagram explain the working of OPAMP as non-inverting amplifier. Derive the expression for its output voltage.

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

- (a) Using maximum power transfer theorem, find the value of R_L for which power transferred in R_L will be maximum :



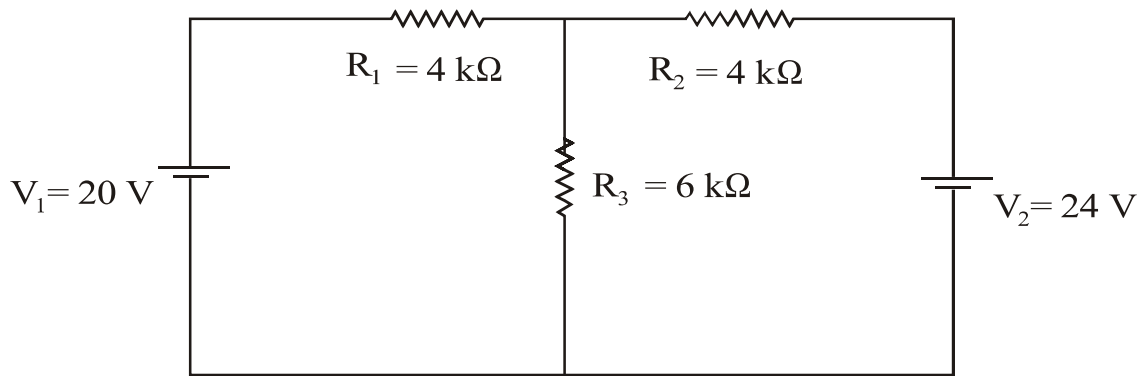
- (b) Define the following terms for resistor :
 - (i) Purchase tolerance
 - (ii) Temperature coefficient of resistance
 - (iii) Power rating
 - (iv) Voltage coefficient of resistance.
- (c) With neat circuit diagram explain the working of diode as clamper.
- (d) Draw a d.c. load line for the following circuit :



- (e) Explain the working of UJT.
- (f) Draw the circuit diagram of OPAMP as subtractor and derive the expression for its output voltage.

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

- (a) Explain the working principle of optocoupler.
- (b) Using Kirchhoff's laws find current through resistor R_3 .



- (c) Explain the working of transistor as switch.
- (d) List any *four* types of switches and explain any *one* in brief.
- (e) Define the following terms for OP-AMP :
 - (i) Input offset voltage
 - (ii) Output Impedance
 - (iii) Slew Rate
 - (iv) Differential Gain.
- (f) Explain the following terms for JFET :
 - (i) Dynamic drain resistance
 - (ii) Transconductance
 - (iii) Amplification factor

and derive the relation between them.

5. Attempt any *two* of the following :

[2×8=16]

(a) (i) Find the colour bands of resistors if its value is

(1) $100 \text{ k}\Omega \pm 10\%$

(2) $4.7 \text{ k}\Omega \pm 1\%$

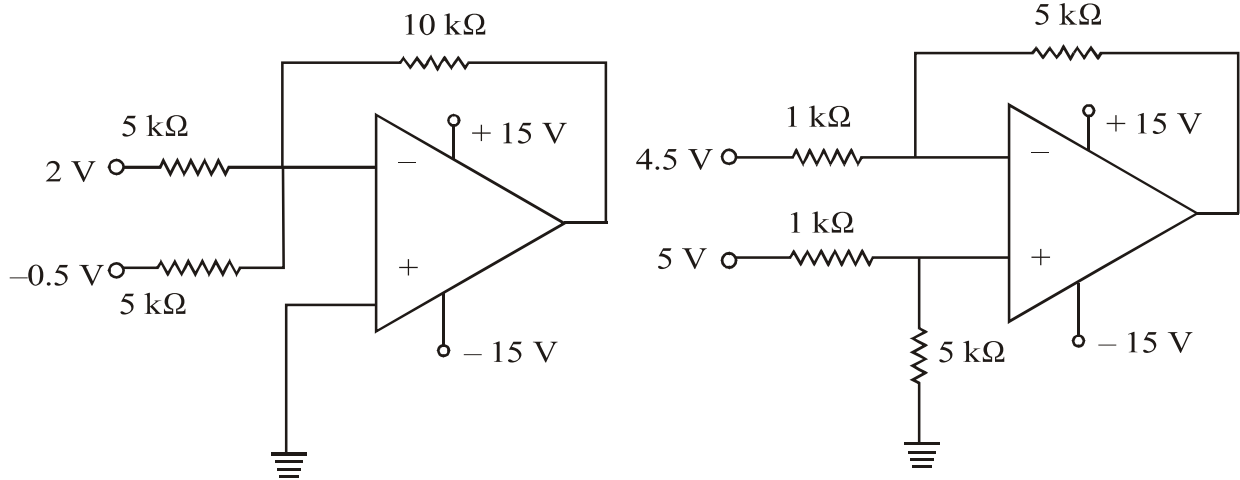
(ii) Compare Half wave and Full wave rectifier. (*Four* points)

(b) (i) Explain the working of series LCR circuit.

(ii) Define α and β for transistor. Derive the expression for α in terms of β .

(c) (i) Explain the working of Depletion mode in N channel DE MOSFET.

(ii) Identify the configuration and find the output voltage.



Total No. of Questions—5]

[Total No. of Printed Pages—4

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[4718]-1006

F.Y. B.Sc. (Computer Science) EXAMINATION, 2015

ELECTRONICS SCIENCE

Paper II

ELC-102 : Principles of Digital Electronics

(2013 PATTERN)

Time : Three Hours

Maximum Marks : 80

N.B. :— (i) *All* questions are compulsory.

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

(iii) Draw neat diagrams wherever necessary.

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

(a) Draw the symbol and truth table for 2 input OR gate and 2 input NAND gate.

(b) Specify the number of variables eliminated for :

(i) a pair

(ii) a quad in a K-map.

(c) Write the truth table for half adder.

(d) Define Demultiplexer.

(e) Define counter.

P.T.O.

- (f) Give full form of CMOS and TTL.
- (g) Show a block diagram representation to obtain T flip-flop using J-K flip-flop.
- (h) What is priority encoder ?

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

- (a) Perform the following conversions :
 - (i) $(0111)_G = (?)_{\text{Binary}}$
 - (ii) $(1100)_2 = (?)_{\text{Gray}}$
 - (iii) $(32)_{10} = (?)_{\text{Excess-3}}$
 - (iv) $(183)_{10} = (?)_{\text{BCD}}$.
- (b) Simplify the following Boolean expression using Boolean laws :

$$Y = (A + B) (A + C).$$
- (c) Draw and explain the working of 4-bit parallel adder.
- (d) Draw and explain the working of 4 : 1 multiplexer built using AND-OR gates.
- (e) Explain the working of J-K master-slave flip-flop with the help of block diagram.

(f) Define the following parameters related to a logic gate :

(i) Propagation delay

(ii) Power dissipation

(iii) Fan out

(iv) Noise margin.

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

(a) Explain the action of EX-OR gate as parity generator.

(b) Convert the following SOP expression into standard SOP form :

$$Y = AB + AC + B\bar{C}.$$

(c) Draw the logic diagram and write the truth table for full subtractor.

(d) Draw the logic diagram of BCD to decimal converter. Explain its working.

(e) Explain the working of 3-bit synchronous up counter.

(f) Draw the logic diagram of TTL NOT gate. Explain its working.

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

(a) Simplify the following expression using K-map

$$Y = \bar{A}\bar{B}\bar{C} + \bar{A}\bar{B}C + \bar{A}BC + ABC.$$

(b) Perform the following subtraction using 2's complement method :

$$(138)_{10} - (72)_{10}.$$

- (c) Draw logic diagram and explain the working of decimal to binary encoder.
- (d) Construct the following counters using decade counter :
 - (i) MOD 2
 - (ii) MOD 3.
- (e) Construct OR and AND gates using NAND gates only.
- (f) Explain the block diagram of ALU.

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

- (a) Perform the following :
 - (i) $(28.47)_{10} = (?)_2$
 - (ii) $(11010.010)_2 = (?)_{10}$
 - (iii) $(43.4)_{10} = (?)_{16}$
 - (iv) $(A2.2)_{16} = (?)_{10}$
- (b) What is a shift register ? List the types of shift registers. Explain the working of 3 bit serial in serial out register for shifting the data to the right.
- (c) Draw the block diagram and explain how a BCD to seven segment decoder is used to interface a seven segment display. Write the truth table for common anode type of display.

Total No. of Questions—5]

[Total No. of Printed Pages—8

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[4718]-1007

F.Y. B.Sc. (Computer Science) EXAMINATION, 2015

STATISTICS

Paper I

(ST-101 : Statistical Methods-I)

(2013 PATTERN)

Time : Three Hours

Maximum Marks : 80

N.B. :— (i) *All questions are compulsory.*

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

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

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

1. (a) Fill in the blanks : [4]

(i) *For a positively skewed distribution the relationship between mean, median and mode is..... .*

(ii) *Binomial distribution has two parameters.....and..... .*

(iii) *A measure of central tendency based on all observations is..... .*

(iv) *The point of intersection of two lines of regression is..... .*

P.T.O.

(b) Select the *correct* option for each of the following : [4]

(i) The most favourite actress is to be decided which is the appropriate average in this case ?

(A) Arithmetic Mean

(B) Mode

(C) Median

(D) Lower Quartile.

(ii) Standard deviation is a measure of :

(A) Central tendency

(B) Skewness

(C) Dispersion

(D) Kurtosis.

(iii) The probability distribution of a discrete random variable (*r.v.*) X is given by :

X	$P(X = x)$
1	0.1
2	0.25
3	0.25
4	0.2
5	0.2

What is $P(2 < X < 5)$?

(A) 0.9

(B) 0.5

(C) 0.45

(D) 0.7

(iv) Let $X \rightarrow P(\lambda = 2)$. Variance of X is :

- (A) 4
- (B) 9
- (C) 2
- (D) 1.4142

(c) Attempt each of the following : [2 marks each]

(i) State empirical relation between mean, median and mode for a moderately skewed distribution.

(ii) Variance of a mesokurtic distribution is 4. Find the value of μ_4 .

(iii) State additive property of a binomial distribution.

(iv) If $b_{xy} = 0.4$, $b_{yx} = 1.6$, then find $r(X, Y)$.

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

(a) Explain the procedure to draw Histogram.

(b) Arithmetic mean of the following frequency distribution is 5, find the value of X .

Variable	Frequency
2	$X - 1$
4	$X + 1$
6	$X + 1$
8	$2X - 5$

(c) Define quartiles. Explain the procedure of computing lower quartile (Q_1) for grouped frequency distribution.

(d) Represent the following data using Box-Plot technique :

15, 11, 11, 28, 22, 14, 13, 18, 30, 12, 25.

(e) Define the following terms :

(1) Standard deviation

(2) Coefficient of variation.

(f) The analyzed 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

(i) Which player has higher batting average ? Why ?

(ii) Which player is more consistent ? Why ?

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

(a) Define median. Explain the procedure of locating median graphically.

(b) Explain the following with *one* illustration of each :

(i) Positive skewness

(ii) Negative skewness.

(c) Given : $\beta_2 = 2.6$, $\beta_1 = 0.19$ and $\mu_2 = 1.2$. Find μ_3 , μ_4 , γ_1 and γ_2 .

- (d) The following is the distribution function of a discrete random variable X :

X	$F(x)$
-3	0.05
-2	0.15
-1	0.38
0	0.57
1	0.72
2	0.88
3	1

Find :

- (i) Probability mass function of r.v. X .
 - (ii) Mode of X .
- (e) Let X follow binomial distribution with mean = 5 and variance = 2.5. Find :
- (i) $P(X \leq 1)$
 - (ii) $P(X \geq 2)$.
- (f) Define Poisson distribution. State Poisson approximation to Binomial distribution. Give one real life situation where Poisson distribution is applicable.
4. Attempt any *two* of the following :
- (a) (i) Explain the concept of correlation for a bivariate data.

Explain its types.

[4]

(ii) If $r = 0.89$, $\Sigma(X - \bar{X})(Y - \bar{Y}) = 122$, $\Sigma(X - \bar{X})^2 = 138$, $\sigma_y^2 = 9.07$, find the value of n . [4]

- (b) (i) Describe the stepwise procedure of fitting $Y = a + bx + cx^2$, using principle of least squares. [4]
- (ii) The following results of capital employed and profit earned by a firm in 10 successive years are given as follows :

	Mean	Standard deviation
Capital employed (Rs. thousand)	55	28.7
Profit earned (Rs. thousand)	13	85

Coefficient of correlation = 0.96.

Estimate the amount of capital to be employed if profit earned is Rs. 25,000. [4]

- (c) (i) Define : [4]
- (1) Expectation of a discrete r.v. [4]
- (2) Variance of a discrete r.v.
- (ii) A r.v. X has the following probability distribution : [4]

X	P(x)
-2	0.1
-1	k
0	0.2
1	$2k$
2	0.3
3	k

Find :

- (1) the value of k
- (2) $P(-1 \leq x < 2)$.

(d) (i) Explain the concept of partial correlation coefficient in a trivariate data. State the expression for the partial correlation coefficient $r_{12.3}$ in terms of total correlation coefficients. [4]

(ii) For a trivariate data : [4]

$$r_{12} = 0.6, \quad r_{13} = 0.4.$$

If $R_{1.23} = 1$, find the values of r_{23} .

5. Attempt any *one* of the following :

(a) (i) Describe the procedure of obtaining the equation of the line of regression of Y on X by the method of least squares for a bivariate data (x_i, y_i) , $i = 1, \dots, n$. [8]

(ii) Compute four yearly centered moving averages for the following data : [8]

Year	Production
	(in '000 tonnes)
2000	150
2001	165
2002	140
2003	160
2004	158
2005	155
2006	165
2007	170

(b) (i) What is time series ? Discuss any *three* components of time series. Give *one* example for each. [8]

(ii) For a trivariate data on X_1 , X_2 and X_3 .

$$\bar{X}_1 = 15.9, \bar{X}_2 = 3.67, \bar{X}_3 = 5.79$$

$$\sigma_1 = 1.71, \sigma_2 = 1.29, \sigma_3 = 3.09$$

$$r_{12} = -0.66, r_{23} = 0.6, r_{13} = -0.13.$$

Obtain the equation of plane of regression of X_2 on X_1 and X_3 . Also, estimate X_2 when $X_1 = 14$ and $X_3 = 6$.

[8]

Total No. of Questions—5]

[Total No. of Printed Pages—6

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[4718]-1008

F.Y. B.Sc. (Computer Science) EXAMINATION, 2015

STATISTICS

Paper II

ST-102 : Statistical Methods-II

(2013 PATTERN)

Time : Three Hours

Maximum Marks : 80

N.B. :— (i) All questions are compulsory.

(ii) Figures to the right indicate full marks.

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

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

1. (a) Attempt each of the following : [1 mark each]

(i) If two events A and B are disjoint, then $P(A \cap B) =$
..... .

(ii) The condition for independence of two events A and B
is..... .

(iii) The mean of Uniform distribution with parameters a and
 b is..... .

(iv) The mean of Pareto distribution with parameter α
is..... .

(b) Attempt each of the following : [1 mark each]

(i) If A is an event, then the conditional probability of A
given that event A has occurred is :

(A) 0.5

(B) zero

(C) one

(D) None of the above

P.T.O.

- (ii) When a card is drawn from the standard pack of playing cards, which of the following is a pair of disjoint events ?
- (A) An ace and an odd denomination
 - (B) A heart and a queen
 - (C) A club and a red card
 - (D) an even denomination and a spade
- (iii) If $A \subset B$, then the relation between $P(A)$ and $P(B)$ is :
- (A) $P(A) \neq P(B)$
 - (B) $P(A) = P(B)$
 - (C) $P(A) > P(B)$
 - (D) $P(A) < P(B)$
- (iv) The probability of rejecting null hypothesis when it is true is :
- (A) type I error
 - (B) type II error
 - (C) type I and II errors both
 - (D) none of the above
- (c) Attempt each of the following : [2 marks each]
- (i) Verify whether the following function can be considered as a valid probability density function :
- $$f(x) = \frac{2(x+2)}{5} \quad ; \quad 0 \leq x \leq 1$$
- $$= 0 \quad ; \quad \text{o.w.}$$
- (ii) State lack of memory property of exponential distribution with mean θ .
- (iii) If $X \rightarrow N(10, 36)$, $Y \rightarrow N(20, 49)$ and if X and Y be independent, then state the distribution of $(X + Y)$.
- (iv) What is simulation ? State in brief.

2. Attempt any *four* of the following : [4 marks each]
- (a) Explain concept of conditional probability of an event. Also, state the formula for $P(A/B)$.
 - (b) Two fair dice are thrown and the outcomes on the uppermost faces are noted. Find the probability that :
 - (i) the product of number on the uppermost faces is 12.
 - (ii) Sum of the numbers shown on the uppermost faces is at least 10.
 - (c) Discuss permutation as a counting principle. Illustrate with an example. Also, state the formula.
 - (d) Out of 50 painting collections, 3 are rare. Five paintings are stolen. Find the probability that :
 - (i) none of the rare paintings are stolen.
 - (ii) two of the three rare paintings are stolen.
 - (e) Define each of the following with an illustration :
 - (i) Mutually exhaustive events
 - (ii) Sure event.
 - (f) A room has 3 sockets for lamps. From a collection of 10 light bulbs of which 6 are defective, a person selects 3 bulbs at random and puts them in a socket. What is the probability that the room is lit ?
3. Attempt any *four* of the following : [4 marks each]
- (a) Define each of the following :
 - (i) An experiment
 - (ii) Sample Space
 - (iii) An Elementary Event
 - (iv) Mutually Exclusive Events.
 - (b) If E_1 and E_2 are equally likely, mutually exclusive and exhaustive events and $P(A/E_1) = 0.2$, $P(A/E_2) = 0.3$, find $P(E_1/A)$.
 - (c) Can two mutually exclusive events be independent ? Can two independent events be mutually exclusive ? Justify your answer.

- (d) If X has uniform distribution in range $(-a, a)$, $a > 0$, find the value of ' a ' such that $P(|X| < 1) = P(|X| > 1)$.
- (e) Under what conditions a continuous function is said to be a probability density function ? Also, state the formula of calculating mean for a continuous random variable with p.d.f. $f(x)$.
- (f) Let X follows normal distribution with mean 3 and variance 25. If $Y = (2X + 4)$, find $P(Y < 8)$.

4. Attempt any *two* of the following :

- (a) (i) State p.d.f. of normal distribution with mean μ and variance σ^2 . Explain how binomial distribution can be approximated by a normal distribution. [4]
- (ii) If a continuous random variable X follows uniform distribution in the range $(2, 7)$, find the probability that X takes value between 2.5 and 4. Also find $P(X < 3.4)$ and $P(X = 3)$. [4]
- (b) (i) Define distribution function of a continuous random variable. State any *two* properties of the distribution function. [4]
- (ii) 20 mangoes were inspected and were labelled as Accepted for export (A) or Rejected for export (R) : [4]

RAAARRRAAAAARARAARAA

Use run test at 5% l.o.s. to decide whether the sequence of accepted and rejected mangoes is random.

- (c) (i) Describe procedure of sign test. [4]
- (ii) In a certain township A, 450 were income tax payers out of a sample of 1000 persons. In another township B, 400 were income tax payers out of a sample of 800 persons. Do these data indicate a significant difference between two townships as far as proportion of income tax payers is concerned ? Use 5% l.o.s. [4]

- (d) (i) Describe Mann-Whitney test to test whether two independent samples are drawn from the same population. [4]
- (ii) Show the area represented by $P(Z \geq 0.8)$ and $P(|Z| < 1.5)$ on the probability curve of standard normal distribution. [4]
5. Attempt any *one* of the following terms :
- (a) (i) Define each of the following : [4]
- Null hypothesis
- Parameter
- Test statistic
- Type II error.
- (ii) A random sample of 1000 school children from rural area shows mean height of 150 cm with standard deviation 45.2 cm. A random sample of 800 school children from urban area shows mean height of 146 cm with standard deviation 37.3 cm. Can we conclude that the children from rural and urban area significantly differ in their mean heights at 5% l.o.s. ? [4]
- (iii) In a radio listener's survey, 120 persons were interviewed and their opinions about preference to Hindi or English music and preference to classical or light music were asked. The results are as follows : [8]
- | | English Music | Hindi Music |
|-----------------|---------------|-------------|
| Classical Music | 13 | 45 |
| Light Music | 39 | 23 |
- Examine at 5% l.o.s., whether the preference to music language is independent of type of music.
- (b) (i) Describe test procedure to test whether proportion of an event in a population differs significantly from P_0 when sample size is greater than 30. [4]

- (ii) Find distribution function of a random variable with the following p.d.f. [4]

$$f(x) = k(3x^2 + 4); 0 \leq x \leq 2$$
$$= 0 ; \quad \text{o.w.}$$

- (iii) It is claimed that the sales of a product (in lakh Rs.) (Y) is a linear function of advertisement cost (in thousand Rs.) (X). Consider the following data :

X	Y
41	46
67	52
92	85
38	50
80	83
84	60

Test the above claim using the test of significance of regression coefficient of Y on X at 5% l.o.s. [8]

Total No. of Questions—5]

[Total No. of Printed Pages—4

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[4718]-2

F.Y. B.Sc. (Computer Science) EXAMINATION, 2015
FILE ORGANISATION AND FUNDAMENTALS OF DATABASE
(2008 PATTERN)

Time : Three Hours

Maximum Marks : 80

N.B. :— (i) *All* questions are compulsory.

(ii) Figures to the right indicate full marks.

(iii) Neat diagram must be drawn whenever necessary.

1. Answer the following questions (any *ten*) : [10]
 - (1) Define order of B^+ tree.
 - (2) State functions of DBA.
 - (3) What is Weak Entity ?
 - (4) What is tuple ?
 - (5) Define Natural Join.
 - (6) List the data type supported by SQL.
 - (7) What is the purpose of Normalization ?
 - (8) Define Prime and Non-prime attribute.
 - (9) What is the use of BETWEEN operators in SQL ?
 - (10) Define Domain.
 - (11) What is a Candidate Key ?
 - (12) List the record based logical models.
2. Answer the following questions (any *four*) : [20]
 - (1) Write a short note on B^+ tree index structure with reference to insertion in B^+ tree organisation.
 - (2) Explain DBMS. What are advantages and disadvantages of DBMS ?
 - (3) Differentiate between Specialization and Generalization.
 - (4) Consider the following relations :
R = (A, B, C, D, G, H, I) and set of FD's defined on R as $\{A \rightarrow B, A \rightarrow C, CG \rightarrow I, B \rightarrow H\}$
 - (i) Compute the closure of F *i.e.* F^+ .
 - (ii) Compute the closure of attribute set $(AG)^+$.

P.T.O.

- (5) What is mapping cardinality ? What are its types ? Explain with example.
3. Answer the following questions (any *four*) : [20]
- (1) Explain Multilevel Index with example.
 - (2) State different file organizations and explain Heap File Organization in detail.
 - (3) Write a short note on Functional Components of a DBMS.
 - (4) What is referential constraint ? Explain in brief.
 - (5) Explain loss-less decomposition with example.
4. (A) Answer the following questions (any *three*) : [15]
- (a) Consider the following relation :
 Doctor (docno, name, specialization)
 Hospital (hospno, name, address)
 Doctor and Hospital are related with many to many relationship.
 Create relational database for the above and convert it 3NF.
 Solve the following queries in SQL :
 - (i) List names of the doctors visiting 'Padghan Hospital'.
 - (ii) Delete all doctors with specialization 'Gynaec'.
 - (iii) List the name of Hospital in 'Shrirampur' city which has more than ten (10) doctors of 'Surgeon' specially visiting it.
 - (b) Consider the following relation :
 Country (Con-code, Name, Capital)
 Population (Pop-Code, Population)
 Country and population related with one to one relationship.
 Create relational database for the above and convert it 3NF and solve the following queries in SQL :
 - (i) List highest population country
 - (ii) Give the name and population of country whose capital is 'Delhi'.
 - (iii) List countrywise population.

- (c) Consider the following relation :
- Wholesaler (w_no, w_name, addr, city)
Product (P_no, P_name)
- Wholesaler and product are related with many to many relationship.
- Create relational database for the above and convert it 3NF.
- Solve the following queries in SQL :
- (i) List all the wholesaler of product 'Books'.
 - (ii) Count the no. of wholesaler in the city 'Shrirampur'.
 - (iii) To print wholesalerwise product.
- (d) 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 3NF.
- Solve the following queries in SQL :
- (i) Find out employees who are working at Shrirampur location.
 - (ii) Find out max. and min. salary for each designation.
 - (iii) Update commission for every employee by 10% who belong to Computer Department.
- (B) Answer the following questions (any one) : [5]
- (a) Consider the following relationships
- Student (Sno, name, addr., class)
Subject (Sub_no, name)
- Student and subject are related with many to many relationships.
- Solve the following queries in relational algebra :
- (i) Find studentwise list of subject
 - (ii) Find the total no. of student for each subject.
 - (iii) Find the name of student who had adapted for the course of 'Computer Science'.

- (iv) Find the no. of students having address as 'Indira-nagar' and Mark less than 60.
 - (v) Print the classwise student.
 - (b) Consider the following relationships :
 - Musician (m_no, m_name, age, m_city)
 - Instrument (i_no, i_name)
 - Plays (m_no, i_no)
 Solve the following queries in relational algebra :
 - (i) List all the musicians having age between 30 to 40 years.
 - (ii) List all the instruments which "Mr. Ambare" plays.
 - (iii) List all 'violin' players who live in 'Shrirampur and their age is below 30.
 - (iv) List all the musicians who play at least one instrument that "Mr. Ambare" plays.
 - (v) Find instrumentwise musicians.
 - 5. (A) Design a database for Banking Enterprises, which record information about customers, employees of bank. A customer can be depositor & an employee of a bank can be customer of bank. There are two types of accounts saving or current.
 - (i) Draw an E.R. Diagram.
 - (ii) Convert E.R. diagram to relational database in 3NF. [7]
 - (B) State the rules of conversion of E.R. diagram to table. [3]
- Or*
- (B) Discuss Memory Hierarchy with diagrams. [3]

Total No. of Questions—5]

[Total No. of Printed Pages—8

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[4718]-3

F.Y. B.Sc. (Computer Science) EXAMINATION, 2015

MATHEMATICS

Discrete Mathematics

(2008 PATTERN)

Time : Three Hours

Maximum Marks : 80

N.B. :— (i) *All* questions are compulsory.

(ii) Figures to the right indicate full marks.

(iii) Neat diagrams must be drawn wherever necessary.

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

(i) State first principle of Mathematical Induction.

(ii) Write negation of each of the following :

(a) $\exists x, (4x = 9)$

(b) $\forall x, \exists y, (x + y = 2).$

(iii) Among the integers 1 to 300, find how many are not divisible by 3 ?

P.T.O.

- (iv) Find first four terms of the sequence defined by the following recurrence relation :

$$a_n = 7a_{n-1} - 10a_{n-2} \text{ with } a_0 = 4, a_1 = 17.$$

- (v) Define with *one* example of each :

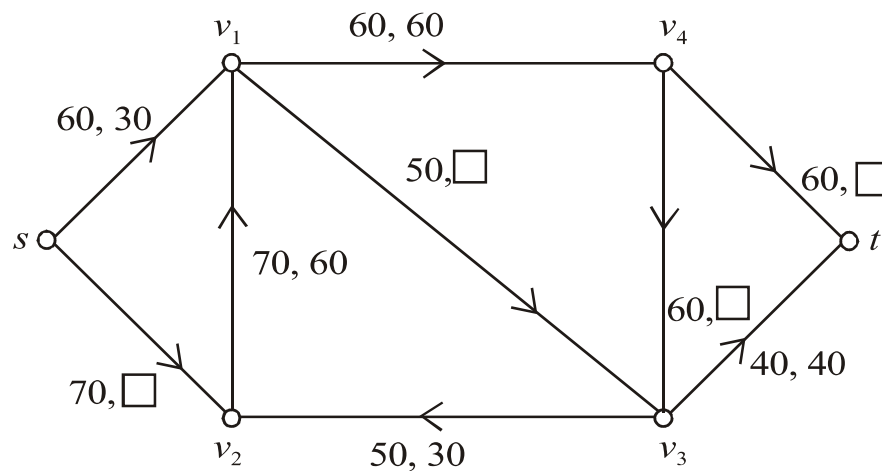
(a) A weighted graph

(b) A bipartite graph.

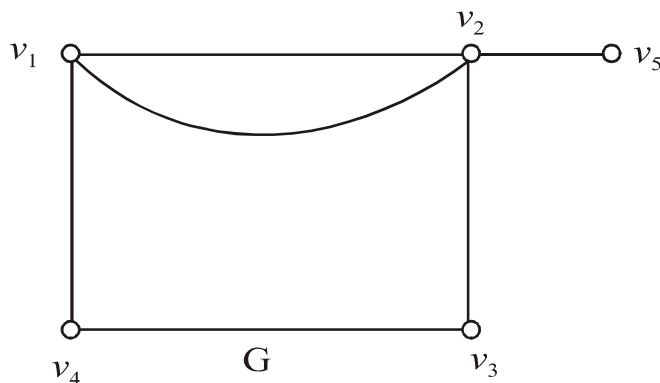
- (vi) Verify Handshaking Lemma for the following degree sequence of a graph :

$$5, 4, 3, 3, 1.$$

- (vii) Find the missing figures in the following network with usual notation :



- (viii) In the following graph G , fuse the vertices v_2 , v_3 and v_5 , hence redraw the graph :



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

- (i) By mathematical induction prove that for $n \geq 2$, $|z_1 + z_2 + \dots + z_n| \leq |z_1| + |z_2| + \dots + |z_n|$ where z_1, z_2, \dots, z_n are complex numbers.

- (ii) Test whether the following propositions are tautologies or not.

Justify :

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

(b) $((p \rightarrow r) \wedge r) \rightarrow p.$

- (iii) Solve the recurrence relation :

$$a_n = 3a_{n-1} + 4a_{n-2} \text{ for } n \geq 2, a_0 = a_1 = 1.$$

- (iv) Sort the following array by bubble sort method and arrange in increasing order

$\langle 3, 0, 2, 10, 7 \rangle$

- (v) The students in a hostel were asked whether they had a TV set or a computer in their rooms. The result showed that 650 students had a TV set, did not have a TV set, 175 had a computer and 50 had neither a TV set nor a computer. Find the number of students who :

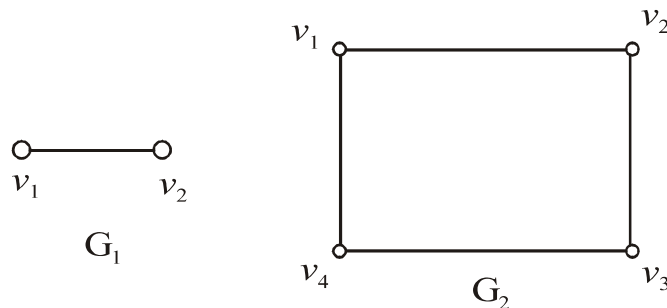
- (a) Live in the hostel
- (b) Have both a TV set and a computer
- (c) Have only a computer.

- (vi) Prove the following argument indirectly :

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

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

- (i) Find the product $G_1 \times G_2$ of the following graphs G_1 and G_2 :



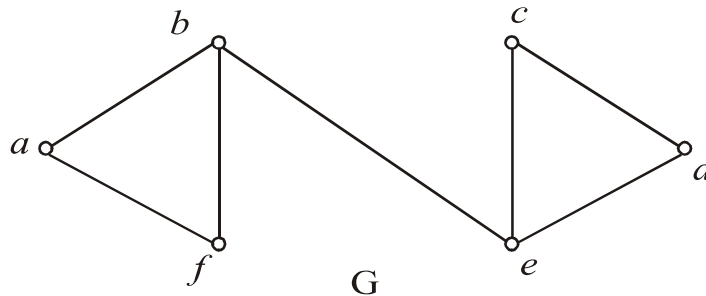
(ii) Draw the graph G with adjacency matrix A :

$$A = \begin{bmatrix} 0 & 2 & 1 & 2 & 0 \\ 2 & 0 & 1 & 2 & 1 \\ 1 & 1 & 0 & 1 & 0 \\ 2 & 2 & 1 & 0 & 1 \\ 0 & 1 & 0 & 1 & 0 \end{bmatrix}.$$

Hence write incidence matrix of G.

(iii) Find eccentricities of all vertices of the following graph G.

Also find centre/s of the graph :

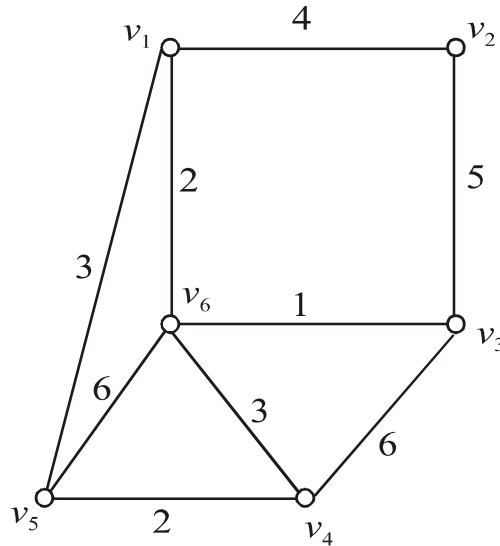


(iv) Draw the arborescence and hence write the following algebraic expression in Polish notation :

$$(7x + y) \times (9a - 5b)^6.$$

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

- (vi) Using Kruskal's algorithm, find the shortest spanning tree of the following graph. Hence find weight of the shortest spanning tree.



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

- (i) Discuss the validity of the following argument :

If Tina marries Rahul, she will be in Pune.

If Tina marries Ganesh, she will be in Mumbai.

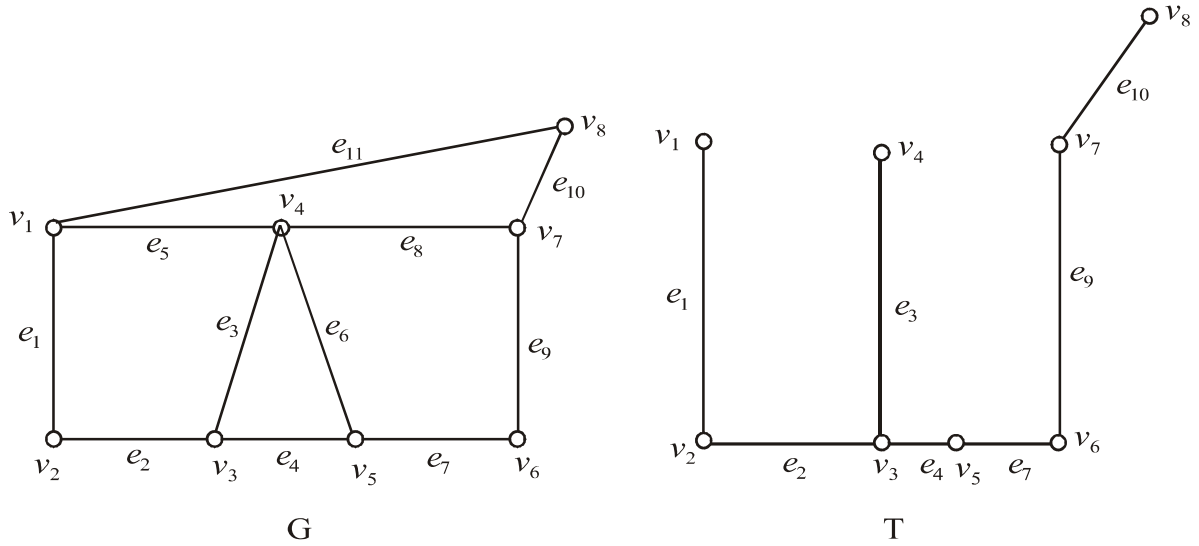
If either she is in Pune or in Mumbai, she will definitely be settled in life. But Tina is not settled in life. Therefore she did not marry either Rahul or Ganesh. (R, P, G, M, S).

- (ii) Solve the following recurrence relation :

$$a_n - 2a_{n-1} = 3^n, \quad a_1 = 1.$$

(iii) State and prove multiplication principle.

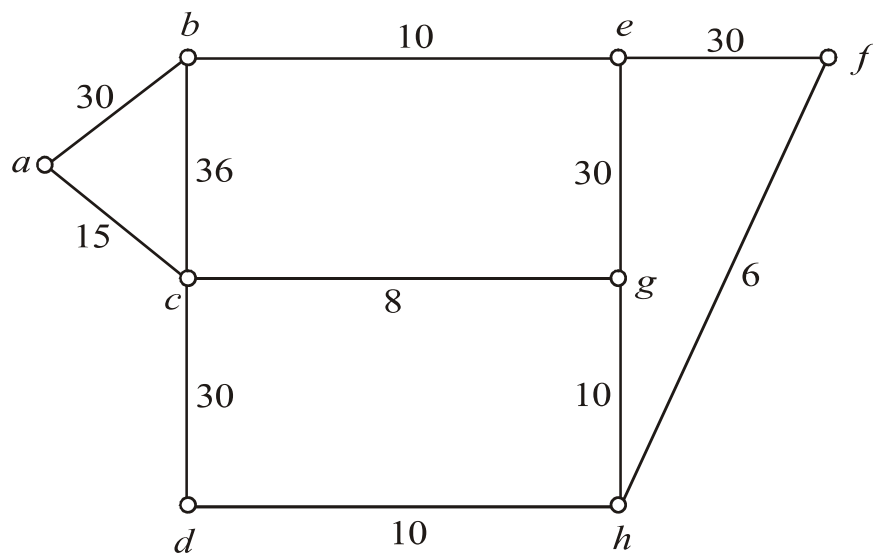
(iv) Consider the following graph G and its spanning tree T .



Find all fundamental circuits and cutsets of G w.r.t. T .

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

(i) Use Dijkstra's algorithm to find the shortest path from vertex a to vertex f in the following graph G .

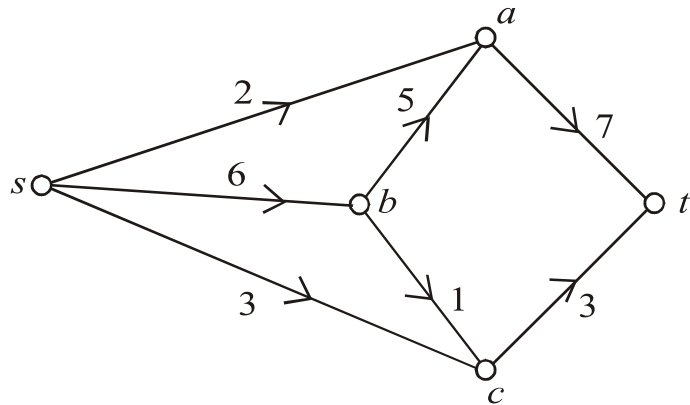


(ii) If G is a connected graph, then prove that :

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

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

(iii) Find maximal flow in the following network :



(iv) (a) Given 10 French books, 20 Spanish books, 8 German books, 15 Russian books and 25 Italian books. How many books must be chosen to guarantee that there are 12 books of the same language ?

(b) How many ways are there to pick a 5-person team from 10 possible players ? How many teams, if the weakest and the strongest players must be on the team ?

Total No. of Questions—5]

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F.Y. B.Sc. (Computer Science) EXAMINATION, 2015

MATHEMATICS

Paper II

(Algebra and Calculus)

(2008 PATTERN)

Time : Three Hours

Maximum Marks : 80

N.B. :— (i) All questions are compulsory.

(ii) Figures to the right indicate full marks.

(iii) Neat diagrams must be drawn wherever necessary.

1. Attempt each of the following : [16]

(1) If

$$f(x) = x^2 \text{ and } g(x) = 3x + 2,$$

find $(f \circ g)(x)$.

(2) Let $A = \{1, 2, 3\}$. $P(A)$ is power set of A define a relation R on $P(A)$ as $A_1 R A_2 \Leftrightarrow A_1$ is subset of A_2 . Check whether relation R is an equivalence relation.

(3) Give example of a relation which is reflexive, transitive but not symmetric. Justify.

(4) Construct addition table for $(\mathbb{Z}_3, +_3)$.

(5) Discuss the applicability of Lagrange's Mean value theorem for the function

$$f(x) = \sqrt{x} \text{ on } [-1, 1].$$

(6) 'The sequence $(-2)^n$ is convergent'. State whether the statement is true or false with justification.

P.T.O.

(7) Discuss the convergence of series $\sum_1^{\infty} \left(\frac{13}{19}\right)^n$.

(8) Find 17th derivative of $y = \sin (3x + 7)$.

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

(1) Find matrix and digraph of relation R

$R = \{(x, y) | x R y \text{ iff } |x - y| = 1\}$ on $A = \{1, 2, 3, 4\}$.

(2) Show that $5^{10} - 3^{10}$ is divisible by 11.

(3) Define distributive lattice. Define complemented lattice. Give an example of a lattice which is not distributive but complemented.

(4) If a, b, c are integers such that $a|bc$ and g.c.d of a and b is 1, then prove $a|c$.

(5) Prove that any *two* equivalence classes are either identical or disjoint.

(6) Construct multiplication table for $(\mathbf{Z}_{10}^*, \times_{10})$.

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

(1) Evaluate :

$$\lim_{x \rightarrow 0} x^2 \log x.$$

(2) Verify Cauchy's Mean value theorem for the function

$f(x) = \frac{1}{x^2}$ and $g(x) = \frac{1}{x}$ in $[a, b]$ and hence show that point

C is harmonic mean of a and b .

(3) Discuss the continuity of function $f(x)$ where,

$$\begin{aligned} f(x) &= 2x - 1 & x &\leq 1 \\ &= x^2 & 1 < x &\leq 2 \\ &= 3x - 4 & 2 < x &\leq 4 \\ &= x^{3/2} & x &> 4. \end{aligned}$$

(4) Find n th derivative of the function $y = \frac{1}{x^2 + 3x + 2}$.

(5) Prove that the sequence $\left(1 + \frac{1}{n}\right)^n$ is convergent.

(6) Discuss the convergence of series

$$\frac{1}{2} + \left(\frac{2}{3}\right)^4 + \left(\frac{3}{4}\right)^9 + \left(\frac{4}{5}\right)^{16} + \dots$$

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

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

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

Find transitive closure of R denoted by R^* . Also find digraph of R^* .

(2) Find g.c.d. of 3997 and 2947 such that $\text{g.c.d.} = 3997x + 2947y$.

(3) Simplify the following expression and write its disjunctive normal form :

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

(4) (a) Show 19 is not divisor of $4n^2 + 4$ for any integer n . [4]

(b) Define partition of a set and prove. If S is a partition of set A , then there exist an equivalence relation on set S such that equivalence classes will form partition of A namely S . [4]

5. Attempt any *two* of the following :

[16]

- (1) (a) Verify Lagrange's mean value theorem for

$$f(x) = \sqrt{9 - x^2} \quad \text{on } [-3, 3].$$

- (b) Using Taylor's theorem prove that

$$\lim_{x \rightarrow 0} \left(\frac{e^x - (1 + \sin x)}{x^2} \right) = \frac{1}{2}.$$

- (2) (a) Consider the sequence $\{x_n\}$ defined by

$$x_1 = \sqrt{2} \quad x_{n+1} = \sqrt{2} x_n \quad n \geq 1,$$

show that $\{x_n\}$ is convergent.

- (b) Discuss the convergence of series

$$\sum \frac{1}{n^p} \quad \text{for } p > 1.$$

- (3) State Leibnitz's theorem and hence prove if $y = \sin^{-1} x$, then

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

- (4) State and prove Rolle's mean value theorem. Interpret geometrically.

Total No. of Questions—5]

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F.Y. B.Sc. (Computer Science) EXAMINATION, 2015
ELECTRONICS
(Electronic Devices, Circuits and Computer Peripherals)
(2008 PATTERN)

Time : Three Hours

Maximum Marks : 80

N.B. :— (i) *All* questions are compulsory.

(ii) Neat diagrams must be drawn wherever necessary.

(iii) Figures to the right indicate full marks.

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

(a) Write statement of Thevenin's theorem.

(b) Define the following terms :

(i) Knee voltage

(ii) Depletion layer.

(c) Draw symbol of :

(i) N channel-JFET

(ii) N-channel MOSFET.

(d) If $\alpha = 0.94$, $I_B = 0.01$ mA, find β and I_C .

(e) Classify amplifiers on the basis of frequency range.

(f) State Barkhausen criteria for sustained oscillations.

(g) What is function of a spike protector ?

(h) Write any *four* components of Hard Disk Drive.

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

(a) Write statements of :

(i) Superposition Theorem

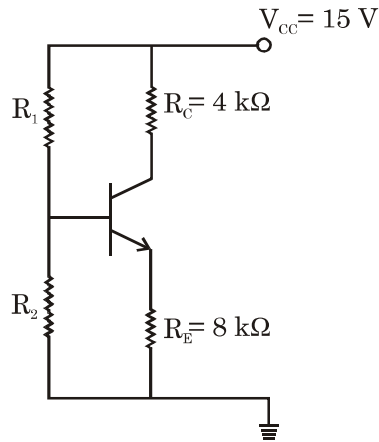
(ii) Maximum Power Transfer Theorem.

(b) Explain concept of feedback. State types of feedback.

(c) Explain working of FET as a switch.

P.T.O.

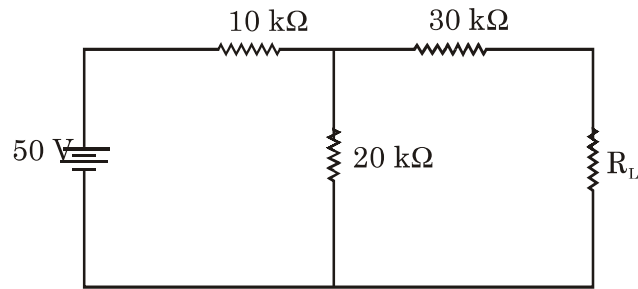
- (d) Draw d.c. loadline for the following circuit :



- (e) State the types of seven segment display. Explain working principle of each.
- (f) Explain need of UPS. Draw block diagram of online UPS.

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

- (a) Find Norton's equivalent circuit for the following circuit :

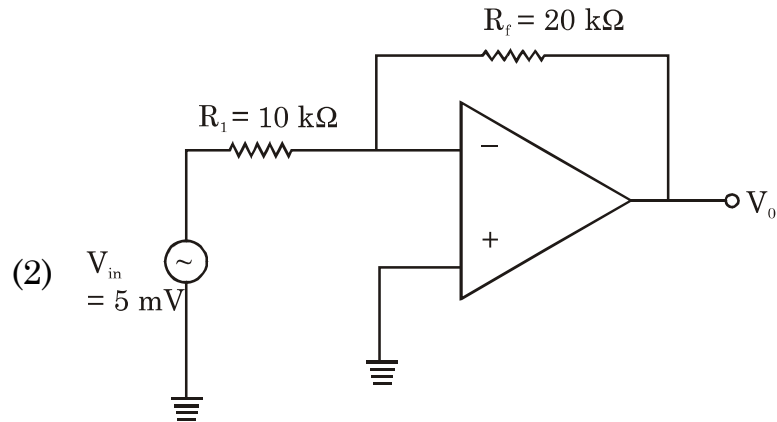
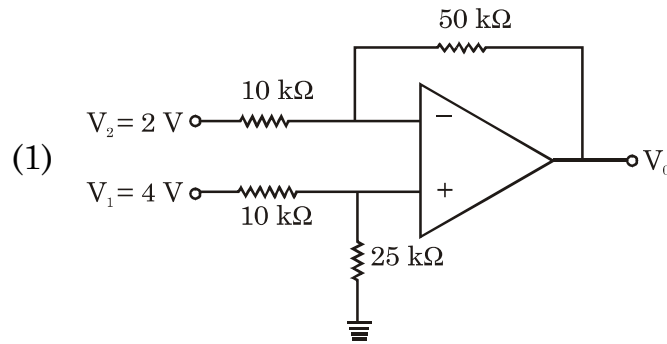


- (b) Differentiate between half wave rectifier, full wave rectifier and bridge rectifier.
- (c) Define the following :
- (i) Voltage amplification factor
 - (ii) Transconductance
 - (iii) Dynamic drain resistance
- of FET and derive relation between them.

- (d) With a neat diagram explain working of OP-Amp as integrator.
- (e) With a neat circuit diagram, explain working principle of photodiode.
- (f) Explain working of phase shift oscillator.

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

- (a) (i) Identify configuration and find output and gain of the following circuits :



- (ii) Explain the working of NPN transistor in brief.
- (b) (i) Draw circuit diagram and explain working of OP-Amp as adder.

- (ii) Explain electronics in the following devices :
 - (1) Optical mouse
 - (2) Light pen.
- (c) (i) Define the following terms w.r.t. power supply :
 - (1) Ripple factor
 - (2) Conversion efficiency
 - (3) Load regulation
 - (4) Line regulation.
- (ii) Draw output characteristics of CE transistor amplifier and explain different regions of graph in brief.
- (d) Explain the operating principle of Laser printer. State advantages and disadvantages.

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

- (a) (i) Draw circuit diagram of non-inverting amplifier using OP-Amp. Write expression for output.
Explain working of N-channel E-only MOSFET.
- (ii) Write any *four* components of motherboard and write function of each.
- (b) (i) What is LCD ? Explain in brief working principle of LCD.
What are the advantages and disadvantages of LCD ?
- (ii) Explain working of Hartley Oscillator.
Write the comparison between SMPS and regulated power supply.

Total No. of Questions—5]

[Total No. of Printed Pages—4

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F.Y. B.Sc. (Computer Science) EXAMINATION, 2015

ELECTRONICS

Paper II

Fundamentals of Digital Electronics

(2008 PATTERN)

Time : Three Hours

Maximum Marks : 80

N.B. :— (i) *All* questions are compulsory.

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

(iii) Draw neat logic diagrams wherever necessary.

(iv) Figures to the right indicate full marks.

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

(a) What is a weighted number system ? Give any *two* examples of the same.

(b) Draw symbol and write the truth table for AND and NOR gates.

(c) Define astable multivibrator.

P.T.O.

- (d) Draw the logic diagram for half subtractor.
- (e) For a 4-bit serial-in serial-out register, how many clock pulses will be required to get data out of the register.
- (f) Define volatile and non-volatile memory.
- (g) Define conversion time of ADC.
- (h) What do you mean by interpreter ?

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

- (a) Perform the following :
 - (i) $(173)_{10} = (?)_{\text{BCD}}$
 - (ii) $(51)_{10} = (?)_{\text{Excess-3}}$
 - (iii) $(1110)_{\text{Binary}} = (?)_{\text{Gray}}$
 - (iv) $(0111)_{\text{Gray}} = (?)_{\text{Binary}}$
- (b) State and verify De Morgan's theorems.
- (c) Draw the logic diagram of octal to binary encoder. Explain its working.
- (d) Draw the logic diagram of R-S flip-flop using four NAND gates and explain its working.
- (e) Explain the working of crystal clock using inverters.
- (f) List the features of RISC.

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

- (a) For a 5 bit R – 2R ladder network with 0 = 0V and 1 = 10 V, find the analog output for digital input 10101.
- (b) What are the differences between assembly language and machine language ?
- (c) Perform the following subtraction using 2's complement method :

$$(118)_{10} - (81)_{10}.$$

- (d) Explain the working of 4×4 diode matrix ROM.
- (e) Simplify the following expression using laws of Boolean algebra :

$$Y = A + B[AC + (B + \bar{C})D]$$

- (f) Draw logic diagram and explain the working of 4-bit parallel adder.

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

- (a) Draw internal diagram of IC-555 and explain the various blocks in it.
- (b) Draw block diagram and explain the working of single slope ADC.
- (c) Explain the working of 3-bit asynchronous up-down counter.
- (d) Draw and explain the working of 1 : 8 demultiplexer.

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

(a) (i) How many memory chips will be required to construct.

(1) 32 kB of memory with basic chip of $4k \times 8$ capacity.

(2) 64 kB of memory with basic chip of $16k \times 4$ capacity.

(ii) Draw and explain the working principle of PROM.

(iii) Construct the following modulo counters using IC7490

(a) MOD 3

(b) MOD 5

(c) MOD 7

(d) MOD 9.

(b) (I) (i) Simplify the following expression using K map :

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

(ii) Perform the following conversions :

(a) $(729)_{10} = (?)_{16}$

(b) $(A4D)_{16} = (?)_2$

(c) $(1110111)_2 = (?)_8$

(d) $(725)_8 = (?)_{10}$

(II) (i) Draw and explain the logic diagram for full adder.

(ii) Explain the working principle of DRAM.

Total No. of Questions—5]

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F.Y. B.Sc. (Computer Science) EXAMINATION, 2015

STATISTICS

(Statistical Methods-I)

(2008 PATTERN)

Time : Three Hours

Maximum Marks : 80

N.B. :— (i) *All* questions are compulsory.

(ii) Figures to the right indicate full marks.

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

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

1. Attempt *all* of the following :

[8×2=16]

(a) Define each of the following :

Attribute, variable.

P.T.O.

- (b) Calculate median from the following data of the heights in inches of a group of students :

64, 64, 61, 62, 63, 61, 63.

- (c) Define mode for grouped frequency distribution.

- (d) Compute coefficient of skewness from the following information :

Upper quartile = 50,

Lower quartile = 40

Median = 45.

Comment on the result.

- (e) Define Karl Pearson's coefficient of correlation.

- (f) For a bivariate data $\bar{X} = 50$, $\bar{Y} = 30$, $b_{yx} = -1.5$ and

$b_{xy} = -0.5$. Estimate y for $x = 48$.

- (g) In a trivariate data :

$r_{23} = 0.8$, $r_{31} = 0.5$, $r_{12} = 0.6$.

Comment on the validity of the above statement.

- (h) What is Time Series ? Give *one* illustration.

2. Attempt any *four* of the following :

[4×4=16]

(a) Explain the following terms :

(i) Cumulative frequency

(ii) Class boundaries.

(b) Define Arithmetic Mean and state merits of mean as a measure of central tendency.

(c) Represent the data showing the number of companies in various ranges of subscribed capital by means of a histogram :

Subscribed Capital	No. of Companies
---------------------------	-------------------------

(in lakhs)

0–10	10
------	----

10–20	12
-------	----

20–30	10
-------	----

30–40	14
-------	----

40–50	7
-------	---

50–60	8
-------	---

- (d) The distribution of heights in cm of 100 people is given below :

Height	Frequency
(in cm)	
145–155	3
155–165	35
165–175	25
175–185	15
185–195	07

Calculate median for the distribution.

- (e) Explain the term dispersion. State different measures of dispersion.
- (f) The data of runs scored by players A and B in 5 cricket test matches is as follows :

	Player A	Player B
Mean	53	45
Standard deviation	40	16

Justify which player is better in average and which player is more consistent.

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

- (a) Write a note on skewness.
- (b) For a moderately skewed distribution the mean is 200, coefficient of variation is 8 and Pearson's coefficient of skewness is 0.3. Find the mode and median.
- (c) Given that $\bar{X} = 1$, $\mu_2 = 3$, $\mu_3 = 0$, $\mu_4 = 27$, find first four raw moments.
- (d) For a frequency distribution, standard deviation is 2. Find the value of fourth central moment if distribution is
 - (i) Mesokurtic
 - (ii) Leptokurtic.
- (e) Define positive correlation and negative correlation with an illustration each.
- (f) For a bivariate data :

$$n = 8, \Sigma X = 544, \Sigma X^2 = 37028, \Sigma Y = 552,$$

$$\Sigma Y^2 = 38132, \Sigma XY = 37560.$$

Compute correlation coefficient and interpret its value.

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

- (a) The two regression lines between heights (X) in inches and weight (Y) in lbs of male students are

$$4X - 15Y + 550 = 0 \text{ and}$$

$$20X - 3Y - 975 = 0.$$

Find mean height and weight of the groups. Also estimate weight of a boy whose height is 80 inches.

- (b) Explain the method of least squares to fit the line of regression of Y on X.
- (c) Describe procedure to fit an equation of type $Y = a + bx + cx^2$ to a bivariate data.
- (d) For the following data :

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

Compute $R_{1.23}$ and $r_{13.2}$.

- (e) What is 'Secular Trend' ? Explain any *one* method of measuring the trend of a time series.

- (f) Ten samples each of size 5 are drawn at regular intervals from a manufacturing process. The sample means (\bar{X}) and their ranges (R) are given below :

Sample No.	Mean (\bar{X})	Range (R)
1	49	7
2	45	5
3	48	7
4	53	9
5	39	5
6	47	8
7	46	8
8	39	6
9	51	7
10	45	6

Calculate control limits in respect of \bar{X} -Chart and R-Chart. Also comment on state of control. For $n = 5$, $A_2 = 0.58$, $D_3 = 0$, $D_4 = 2.115$.

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

- (a) In a trivariate distribution on :

X_1 : Marks in Mathematics,

X_2 : Marks in Physics

X_3 : Marks in Statistics.

$$\bar{X}_1 = 68, \quad \bar{X}_2 = 70 \quad \bar{X}_3 = 74$$

$$\sigma_1^2 = 100, \quad \sigma_2^2 = 25, \quad \sigma_3^2 = 81.$$

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

Determine the regression equation of X_3 on X_1 and X_2 , if the variables are measured from their respective means.

- (b) Explain the concept of multiple regression for a trivariate data with *one* illustration.
- (c) Calculate 3-yearly moving averages for the following data :

Year	Inventory (in tonnes)
1998	78
1999	73
2000	71
2001	73
2002	75
2003	78
2004	73

- (d) Explain the following terms :
- (i) Chance cause of variation
- (ii) Assignable cause of variation.
- (e) State properties of regression coefficients for a bivariate data.
- (f) Consider the following bivariate data :

X	Y
6	9
2	11
10	5
4	8
8	7

Compute Rank correlation coefficient between X and Y.

Total No. of Questions—5]

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F.Y. B.Sc. (Computer Science) EXAMINATION, 2015

STATISTICS

(Statistical Methods–II)

(2008 PATTERN)

Time : Three Hours

Maximum Marks : 80

N.B. :— (i) *All* questions are compulsory.

(ii) Figures to the right indicate full marks.

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

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

1. Attempt *all* of the following questions :

[8×2=16]

(a) Define the following terms :

(i) Finite sample space

(ii) Countably infinite sample space.

P.T.O.

- (b) Let A and B be two independent events defined on Ω such that $P(A) = 1/4$, $P(B) = 1/3$. Find $P(A' \cap B)$.
- (c) State axioms of probability.
- (d) Let $X \rightarrow B(n, p)$. Find the value of p if $n = 25$ and mean $= 10$.
- (e) One ticket is drawn at random from a bag containing 30 tickets numbered 1 to 30. Find the probability that it is a multiple of 3 or 5.
- (f) State the mean and variance of Geometric distribution.
- (g) For a continuous random variable X if $V(X) = 3/80$, find $V(4X - 2)$.
- (h) State any *two* disadvantages of simulation.

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

- (a) A jar contains 4 white, 2 blue and 6 green counters. 2 counters are taken out. What is the probability that they are of :
 - (i) same colour
 - (ii) different colours.

- (b) State classical definition of probability. Also state its limitations.
- (c) Let A and B be 2 events defined on Ω . If $P(A) = 0.39$, $P(B) = 0.21$ and $P(A \cup B) = 0.47$, then find :
- (i) $P(A|B)$
- (ii) $P(B|A)$.
- (d) Explain deterministic and non-deterministic experiments.
- (e) 8 persons including A and B sit in a row at random. Find the probability that :
- (i) A and B always sit together
- (ii) A and B occupy end seats.
- (f) Define independence of 2 events. If A and B are independent events defined on Ω , then show that A' and B' are also independent.

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

- (a) State any 4 properties of distribution function of a discrete random variable.

- (b) Let X be a random variable with the following probability distribution :

X	$P(X = x)$
0	$1/3$
1	$1/2$
2	$1/24$
3	$1/8$

Find :

- (i) $E(X)$
- (ii) Cumulative distribution function of X .
- (c) Number of cars hired by a car hire company on a day follows Poisson distribution with mean 3. Find the probability that on a given day :
- (i) No car is hired
- (ii) More than 3 cars are hired.
- (d) Define Binomial distribution. Give *one* real life situation where Binomial distribution is used. Also state its additive property.

(e) It is known that only 10% of the applicants for a certain post are suitable for the job. Find :

(i) the probability that the third person interviewed will be the first suitable one.

(ii) expected number of candidates required to be interviewed until a suitable one is found.

(f) State probability mass function of discrete uniform distribution. Also state its mean and variance.

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

(a) A continuous random variable X has the following probability density function :

$$f(x) = k(x - 1)^2 \quad 1 \leq x \leq 3$$
$$0 \quad \text{o.w.}$$

(i) Find the value of k

(ii) Find $P(X \leq 2)$.

(b) Define Exponential distribution with mean θ . State its distribution function. Also state its lack of memory property.

- (c) The average daily procurement of fresh milk (in thousands of litres) by a milk producer's union follows uniform distribution over 25 to 40. Find the probability that daily procurement exceeds 30. Also find the mean daily procurement.
- (d) For a continuous random variable X define :
- (i) Probability density function
 - (ii) Cumulative distribution function.
- (e) A monthly balance on the bank account of credit card holders is assumed to be Normally distributed with mean Rs. 50,000 and standard deviation Rs. 10,000. What is the probability that a card holder has balance :
- (i) Greater than Rs. 40,000
 - (ii) Less than Rs. 20,000.
- (f) Suppose lifetime of a component is exponentially distributed with mean 150 hours. Find the probability the component
- (i) survives upto 200 hours
 - (ii) survives for at least 50 hours.

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

(a) Explain the procedure of drawing a model sample from Uniform distribution.

(b) A die is tossed 300 times and gave the following results :

Score	Frequency
1	43
2	56
3	49
4	45
5	66
6	41

Can the die be regarded as unbiased at 1% l.o.s.

(c) Describe the test procedure for testing $H_0 : \mu = \mu_0$ against

$H_1 : \mu \neq \mu_0$ at $\alpha\%$ l.o.s. (Assume $n > 30$).

(d) A soap manufacturing company claims that 40% of households use their brand of soap. In a survey it was found that out of 1600 households interviewed, 532 use that particular brand.

Is the company's claim justified at 5% l.o.s. ?

(e) Define the following terms :

(i) Null hypothesis

(ii) Alternative hypothesis

(iii) Level of significance

(iv) Type II error.

(f) The arrangement of diseased (D) and healthy (H) plants in a row of strawberries is given below :

HHHDDHDHHHHDDHDDDDHHH.

Use run test to test the randomness of arrangement (Use $\alpha = 0.05$).