

(Time: 2½ Hours)

[Total Marks: 75]

- N.B.
- 1) All questions are compulsory.
 - 2) Figures to the right indicate marks.
 - 3) Illustrations, in-depth answers and diagrams will be appreciated.
 - 4) Mixing of sub-questions is not allowed.
 - 5) Use of own non-programmable calculator is allowed.

Q. 1 Attempt All (Each of 5Marks)

(15M)

(a) Multiple choice questions

- i. The range of correlation coefficient is
A. 0 to 1 B. -1 to 1 C. -1 to 0 D. None of the above
- ii. If B is subset of A then $p(A/B) = \dots$
A. 1 B. $P(A)$ C. $P(B)$ D. None of the above
- iii. In less than type ogive curve, the points are plotted for
.....
A. the lower boundary and frequency.
B. the upper boundary and cumulative frequency.
C. the lower boundary and cumulative frequency.
D. None of the above
- iv. The measure of central tendency which can be used for further mathematical treatment is
A. Mean
B. Median
C. Mode
D. All the above
- v. If the lower and upper limits of the class interval are 20 and 30 respectively then the class mark will be
A. 10 B. 50 C. 30 D. 25

(b) Fill in the blanks

- i. Mode is the occurring value in data set.
- ii. In histogram the width of the bar will be decided on the basis of
- iii. If the correlation coefficient between two variables X and Y is perfect then the correlation coefficient $r = \dots$
- iv. For $Y = a + bx$, Y is called as variable.
- v. $p(A \cap A') = \dots$

(c) Short answers.

- i. Write two requisites of good measure of central tendency.
- ii. Define variance.
- iii. Write the formula of regression coefficient of X on Y.
- iv. Define probability.
- v. Define mutually exclusive events

(15M)

Q. 2 Attempt the following (Any THREE)(Each of 5Marks)

- (a) Explain with one example Nominal scale, Ordinal scale and ratio scale.
- (b) Write a short note on
i. Frequency polygon. ii. Stem and leaf plot.
- (c) Given the following data on the marks obtained by students in some examination.
22,24,15,25,10,12,14,8,2,4,
4,6,12,14,16,17,18,18,17,14,10,10,8,9,22,21,23,20,18.
Construct frequency distribution with inclusive type class interval.
- (d) Obtain mean and mode for the following data
- | C.I. | 10-20 | 20-30 | 30-40 | 40-50 | 50-60 | 60-70 |
|-----------|-------|-------|-------|-------|-------|-------|
| Frequency | 2 | 4 | 7 | 5 | 4 | 3 |
- (e) Explain the procedure of obtaining Quartile deviation for grouped data.
- (f) Define standard deviation and Find coefficient of variation for the following data X: 12,13,14,15,16,12,14,16,13,15,14,14,12

(15M)

Q. 3 Attempt the following (Any THREE)(Each of 5Marks)

- (a) Define first four raw moments about origin zero and central moments of a distribution. Also state the relationship between raw and central moments
- (b) Explain the concept of skewness. Also distinguish between positive and Negative skewness.
- (c) With usual notation $\mu_1=2$, $\mu_2=8$, $\mu_3=14$ and $\mu_4=50$ then Compute β_1 and β_2 .
- (d) Represent Positive, Negative and Perfect correlation using scatter plots.
- (e) Explain the concept of correlation and regression. Also comment, how regression is different from correlation.
- (f) For the following data obtain the regression line of the type Y on X
- | X | 12 | 14 | 16 | 14 | 15 | 18 |
|---|----|----|----|----|----|----|
| Y | 2 | 4 | 7 | 5 | 4 | 3 |

(15M)

Q. 4 Attempt the following (Any THREE)(Each of 5Marks)

- (a) Define the Following with one example:-
i. Random Experiment with one example.
ii. Sample space and Event with one example.
- (b) A ticket is drawn from a box containing 30 tickets and a number on it is observed. Obtain the probability that ticket drawn has a number
i. Less than 6
ii. Greater than 20
iii. Multiple of 5.
- (c) The letter of the word 'EQUATION' are arranged randomly. What is the probability that an arrangement
i. Starts and ends with vowel.
ii. Have all vowels together.
iii. State Addition theorem and Bay's theorem.
- (d) State Addition Theorem and Bay's Theorem.

- (e) Two dice are thrown simultaneously. Find the probability that the sum being 6 or same number on both dice.
- (f) A hospital has 3 doctors X, Y & Z operating independently. The probability that doctor X is available is 0.9 and that for Y is 0.6 and for Z is 0.7; What is the probability that at least one doctor is available when needed?

Q. 5 Attempt the following (Any THREE)(Each of 5Marks) (15M)

- (a) Explain the procedure of plotting Bar chart and Pie Chart.
 (b) Write two merits and two demerits of the Mode and Coefficient of range.
 (c) Define Kurtosis and explain different types of kurtosis.
 (d) Obtain Spearman's Rank correlation between performance in Maths and Computer Science. The scores are given below:

Maths	56	65	72	48	56	70	68
Computer Science	76	60	50	75	66	.87	77

- (e) If the two regression equations are $4y - 5x - 33 = 0$ and $20y - 9x - 107 = 0$,
 Find: - i. Mean of x and y ii. Correlation coefficient between x and y.
 (f) Stockiest has 20 items in a lot. Out of which 12 are non-defective and 8 are defective. A customer selects 3 items from the lot. What is the probability that out of these three items:-
 i. Three items are non-defective
 ii. Two are non-defective and one is defective

Computer Organization & Design (45)

S0131 / S9052 / COMPUTER ORGANIZATION & DESIGN.

Q.P.Code: 12186

(2½ Hours)

[Total Marks: 75]

- N.B. 1) All questions are compulsory.
2) Figures to the right indicate marks.
3) Illustrations, in-depth answers and diagrams will be appreciated.
4) Mixing of sub-questions is not allowed.

Q. 1 Attempt All(Each of 5Marks) (15)

(a) Select appropriate choice from the following

- i. ASCII code is --- bit code.
a) 2 b) 5 c) 16 d) 8
- ii. Which of the following system is digital.
a) Electrical switch b) electronic counter c) Mercury Thermometer d) None of the above
- iii. If one of the input to an OR gate is high its output will be _____.
a) Medium b) High c) Low
- iv. The assembled machine language program is called _____.
a) Object Code b) Executable code c) Source code
- v. The number of data registers in coldfire processor is _____.
a) 2 b) 4 c) 8 d) None of these

(b) Fill in the blanks

1. If one of the inputs to an OR gate is high its output will be _____.
2. The number of inputs to a logic gate is called its _____.
3. In decimal number system base is _____.
4. A K-map of n variables contains _____ cells.
5. CISC stands for _____.

(c) Short Answers.

- i. Define Sequential circuit.
- ii. What is the binary equivalent of decimal 25?
- iii. What is parity bit?
- iv. Define fan-out.
- v. Define exception.

Q. 2 Attempt the following (Any THREE)(Each of 5Marks) (15)

(a) Draw a neat basic block diagram of computer system.

(b) State & explain number systems used in computer system.

(c) What is the role of shift register? Explain with 4-bit shift register.

(d) What is gated S-R latch?

(e) Explain tristate buffers.

(f) Explain the concept of universal gate.

P.T.O

EC6DA5EB9DDC7E44E42060618B30E8EF

Scanned by CamScanner

Q. 3 Attempt the following (Any THREE) (Each of 5Marks) (15)

- (a) Define terms: Memory word, word length, Address & address space.
(b) Explain How memory is used in read write operations.
(c) The HLL statement $z=x*y$ when gets compiled what type of machine instructions will get used?
(d) Explain characteristics of CISC instruction set.
(e) What is pointer? Explain its use in indirection operation.
(f) Discuss the typeof machine instructions.

Q. 4 Attempt the following (Any THREE) (Each of 5Marks) (15)

- (a) Explain arithmetic, logic & Load instructions with example.
(b) Discuss the conceptual view required for computing.
(c) How data movement & manipulation operations performed using Data Path.
(d) With neat diagram explain organisation of instruction fetch section of the processor.
(e) What is an exception? Give example.
(f) Explain program controlled I/O.

Q. 5 Attempt the following (Any THREE) (Each of 5Marks) (15)

- (a) Explain implementation of AND, NOT GATES using NOR.
(b) Explain the use of Stacks in computer operations with example.
(c) What are the components of processor?
(d) Convert decimal number 356 to binary & octal form.
(e) Explain instruction execution & straight line dsequencing.

Database System

Q. P. Code: 12182

(Time: 2 ½ Hours)

[Total Marks: 75]

- N.B. 1) All questions are compulsory.
2) Figures to the right indicate marks.
3) Illustrations, in-depth answers and diagrams will be appreciated.
4) Mixing of sub-questions is not allowed.
5) Assume suitable data if necessary and state it clearly.

Q. 1 Attempt All.

(a) Multiple Choice Questions

(15M)

1. A _____ in a table represents a relationship among a set of values.
 - A) Column
 - B) key
 - C) Row
 - D) Entry
2. Consider attributes ID, CITY and NAME. Which one of this can be considered as a super key?
 - A) NAME
 - B) ID
 - C) CITY
 - D) CITY , ID
3. Which of the following is used to denote the selection operation in relational algebra?
 - A) Pi(Greek)
 - B) Sigma(Greek)
 - C) Lambda(Greek)
 - D) Omega (Greek)
4. Which of the following query is correct for using comparison operators in SQL:
 - A) SELECT sname, coursename FROM studentinfo ;
 - B) SELECT sname, coursename FROM studentinfo
WHERE age>50 && age <80;
 - C) SELECT sname, coursename FROM studentinfo
WHERE age>50 & WHERE age<80;
 - D) None of the above

5. In 2NF

- A) No functional dependencies exist.
- B) No multivalued dependencies exist.
- C) No partial functional dependencies exist
- D) No partial multivalued dependencies exist

(b) Fill in the blanks.

1. Field is otherwise called as of the record.
2. The is related to the concept of multi-valued dependency.
3. The _____ operator takes the results of two queries and returns only rows that appear in both result sets.
4. Architecture of the database can be viewed as ____.
5. is a full form of SQL

(c) Short Answers

1. State any two examples based on derived attribute.
2. Write syntax of select operation of relational algebra.
3. What is the output produced by date () function?
4. Explain the string function ltrim () with example.
5. Define the term DBMS.

Q. 2 Attempt the following (Any THREE)

(15M) (f)

(a) State the drawback of traditional file processing systems.

(b) Show an E-R diagram illustrating the use entity sets listed.

Galleries keep information about artists, their names (which are unique), birthplaces, age, and style of art. For each piece of artwork, the artist, the year it was made, its unique title, its type of art (e.g., painting, lithograph, sculpture, photograph), and its price must be stored. Pieces of artwork are also classified into groups of various kinds, for example, portraits, still lifes, works by Picasso, or works of the 19th century; a given piece may belong to more than one group.

Each group is identified by a name (like those just given) that describes the group. Finally, galleries keep information about customers. For each customer, galleries keep that person's unique name, address, total amount of dollars spent in the gallery (very important!), and the artists and groups of art that the customer tends to like.

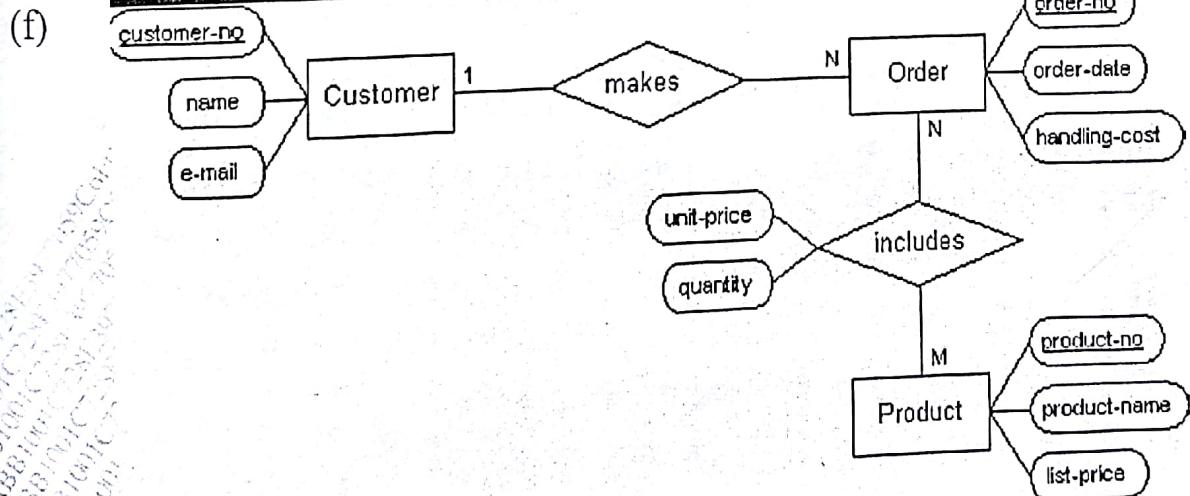
(c)	List and
(d)	What do with su
(e)	List an
(f)	Draw [Assu
Q. 3	Atte
(a)	Givin
(b)	Expl
(c)	Dis
(d)	Pe

- (c) List and explain List and explain different database users.
- (d) What do you mean by Null constraint, Check constraint? Discuss with suitable example?
- (e) List and explain different types of mapping cardinalities.
- (f) Draw an ER diagram showing movie ticket management system.
[Assume suitable data and state them clearly.]

Q. 3 Attempt the following (Any THREE) (15M)

- (a) Giving 2 examples explain 1 NF.
- (b) Explain any 3 aggregate functions with examples.
- (c) Discuss cross product, union operations from relational algebra with suitable example.
- (d) Perform following using mysql
 - 1) Create a table student (rollno, name, address) rollno is PK.
 - 2) Insert 2 records.
 - 3) Delete a record whose rollno is 3.
 - 4) Find a record whose name starts with a.

(e) How to perform commit and rollback operation give example to support your answer.



Construct tables from the above ER diagram. [assume suitable mapping cardinalities and mention them.]

(15)

Q. 4 Attempt the following (Any THREE)

- (a) Explain the concept of functional dependency with suitable example.
- (b) Describe the process of creating user in mysql.
- (c) Write a short note on how to create a view with suitable example.
- (d) Perform following by assuming suitable data and database.
- 1) Create a report that shows the city, company name, and contact name of all customers who are in cities that begin with "A" or "B." Sort by contact name in descending order.
 - 2) Create a report that shows the company name, contact name and fax number of all customers that have a fax number. Sort by company name.
 - 3) select name from student where name like '%i';
- (e) What do you mean by privilege with respect to database and its types.
- (f) Discuss various types of Threats to Databases.

Q. 5 Attempt the following (Any THREE)

(15)

- (a) Consider the following entities for a hospital management system.

Equipment: The main attributes are identification number, name, description of its functionalities, type, location, purchase cost, purchase date, etc.

Department: The main attributes are identification number, name, address, total number of doctors, total number of nurses, etc.

Doctor: The main attributes are identification number, name, address, area of specialty, current working schedule, etc.

Nurse: The main attributes are identification number, name, address, skills, current working schedule, etc.

Patient: The main attributes are identification number, name, address, type (inpatient or outpatient), disease, etc.

Room: The main attributes are room number, type (operating room, ward, etc.), capacity, description, etc.

Draw ER diagram and define relationships.

(b) Write queries in relational algebra form:

- 1) Find the information of name "ram" from student table.
- 2) Select the records from student table who has marks > 60
- 3) Find all students having marks < 40 from student table.
- 4) Rename student table to SST.
- 5) Find name from student whose address is virar.

(c) Discuss avg (), max (), min () functions with suitable example.

(d) Write a note on sub-query and provide example.

(e) Define the terms data, information, entity, attribute, relationship.

Free & Open Source Software

Q. P. Code: 12210

(Time: 2½ Hours)

- N.B.
- 1) All questions are compulsory. [Total Marks: 75]
 - 2) Figures to the right indicate marks.
 - 3) Illustrations, in-depth answers and diagrams will be appreciated.
 - 4) Mixing of sub-questions is not allowed.

Q. 1 Attempt All (Each of 5Marks) (15M)

(a) Multiple Choice Questions

- i. Public domain software are those software which are available in public domain and there is
 - a. Copyright
 - b. no patent
 - c. no trademark
 - d. no license
- ii. GDB stands for
 - a. GNU Debugger
 - b. GNU Database
 - c. GNU Developer
 - d. GNU Design
- iii. GPL stands for
 - a. General Public License
 - b. Global Public License
 - c. GNU Public License
 - d. GNU Permissive License
- iv. Google Talk is an example of
 - a. Free software
 - b. Licensed software
 - c. Shareware software
 - d. Proprietary software
- v. Windows NT is a licensed operating system based on
 - a. Microsoft
 - b. Solaris
 - c. IBM
 - d. Sun Microsystems

(b) Fill in the blanks

(Open source python IDE, open source initiative, Linux, Web sites, Mozilla thunderbird, Internet explorer, Sun Microsystems IDE for java, open system interchange, Android, Chrome, operating system software)

- i. Eclipse is _____ software.
- ii. OSI with regards to open source software stand for _____.
- iii. _____ operating is free open system for PC.
- iv. Wordpress is free, open source software used to create and manage various types of _____.
- v. _____ is free and open source web browser developed by Mozilla foundation.

(c) Write Answers in two lines.

- i. What is FreeBSD?
- ii. What is shared source?
- iii. Define the term "free software"
- iv. What is "patent" in open source development?
- v. What is containerization?

(15M)

Q. 2 Attempt the following (Any THREE) (Each of 5Marks)

- (a) Compare and contrast Open source vs. closed source.
- (b) Explain the concept of Marginal Cost and Zero Marginal Cost with regards to FOSS.
- (c) Write short note on Open source ethics.
- (d) Define license? How does license apply to works in public domain? Explain.
- (e) Write a note on the following:
 - i. Apache license
 - ii. LGPL license
- (f) Give the importance of open source in government.

(15M)

Q. 3 Attempt the following (Any THREE) (Each of 5Marks)

- (a) Discuss Apache Web server case study in detail.
- (b) Differentiate between Commercial design practice and Free design practice.
- (c) Write a note on GitHub.
- (d) Define Open source hardware. How hardware can be 'Open'?
- (e) What is Wikipedia? How to contribute into it? Explain.
- (f) Explain the following points in Open source teaching:-
 - i. Meaning
 - ii. What are Learning Objects?
 - iii. Where do the Learning objects come from?

(15M)

Q. 4 Attempt the following (Any THREE) (Each of 5Marks)

- (a) What is Android Operating system? Discuss.
- (b) Write a short note on LAMP.
- (c) Explain in detail the concept of Virtualization.
- (d) Discuss in detail any two Open source database technologies.
- (e) Define the terms: - IDEs, Development Tools, Docker, and Programming Language. Give examples.
- (f) What is Linux operating system? Explain its features.

Q. 5 Attempt the following (Any THREE) (Each of 5Marks)

(15M)

- (a) Explain Shared software and Shared source.
- (b) Write a note on Open source media.
- (c) Distinguish between Copyright and Copyleft.
- (d) With the help of diagram, explain open source methodology.
- (e) Define software freedom. What are four degrees of freedoms for Free software?

Comp. Prog. A Python - I

Q. P. Code: 12208

(Time: 2½ Hours)

[Total Marks: 75]

- N.B. 1) All questions are compulsory.
2) Figures to the right indicate marks.
3) Illustrations, in-depth answers and diagrams will be appreciated.
4) Mixing of sub-questions is not allowed.
5) Assume suitable data wherever required.

Q. 1 Attempt All (Each of 5Marks)

(15M)

(a) Multiple Choice Questions

1. <, >, <= are _____ operators
 - i) Arithmetic
 - ii) Logical
 - iii) Relational
 - iv) Assignment
2. Which of the following function converts a string to all lowercase?
 - i) lower()
 - ii) isdecimal()
 - iii) swapcase()
 - iv) title()
3. Python is _____ language.
 - i) Compiled
 - ii) Procedure
 - iii) Interpreted
 - iv) Non-Interactive
4. What is the output of len(["Hello", "world", "Python"])?
 - i) 1
 - ii) 2
 - iii) 3
 - iv) 4
5. What is "Hello".replace("l", "e")
 - ii) Heeee
 - ii) Hillo
 - iii) Heleo
 - iv) None of these

(b) Fill in the blanks

1. What is the data type of the below object _____?
T = ("PY", 22, 'hello', 1).
2. Ternary operator (?) is used for _____
3. The term IDLE stands for _____
4. To use in-built mathematical functions we need to import _____ module.
5. An instance of a class is called as _____

(c) Write answers for the following in few lines

1. Define Assignment statement.
2. Write the use of del statement.
3. What is the output when following statement is executed _____?
>>>"a"+ "b"
4. Define Expression statement.
5. Explain the use of "break" statement.

(15M)

Q. 2 Attempt the following (Any THREE)

- (a) What is the difference between simple and compound statements?
Explain with example.
- (b) What is Datatype? What are the rules and conventions for declaring a variable?
- (c) Explain any five arithmetic operators in Python.
- (d) Write a short note on tuple.
- (e) Define Function. Write the syntax to define function. Give example of function definition.
- (f) Write a program to calculate Simple Interest. Take Principal amount, rate of interest and number of years from the user. (Hint: Simple Interest = $(\text{Principal amount} * \text{Rate of interest} * \text{Number of years}) / 100$.)

(15M)

Q. 3 Attempt the following (Any THREE)

- (a) How do we implement if, elif, else condition? Explain with an example.
- (b) Discuss the difference between local and global variable.
- (c) What is actual and formal parameter? Explain the difference along with an example.
- (d) Explain continue statement.
- (e) What is nested while loop? Explain with example.
- (f) Write a program to print reverse of a number. Take input from user.

(15M)

Q. 4 Attempt the following (Any THREE) (Each of 5Marks)

- (a) Discuss Anonymous function.
- (b) Explain "Dictionary" concept.
- (c) Define Built-in functions. List any 4 built-in functions. Explain dir() functions.
- (d) Write a program to create an anonymous function to calculate cube of a number.
- (e) What is List? Explain with example.
- (f) Write a short note on class.

(15M)

Q. 5 Attempt the following (Any THREE) (Each of 5Marks)

- (a) Discuss Operator Precedence along with an example.
- (b) Explain Time module and its function.
- (c) What is comment? Why we need it? How do we implement it?
- (d) Write a python program to take a string from user and count number of vowel present in it.
- (e) Explain for loop with example.

Discrete Mathematics

Q. P. Code: 12212

(Time: 2½ Hours)

[Total Marks: 75]

- N.B.
- 1) All questions are compulsory.
 - 2) Figures to the right indicate marks.
 - 3) Illustrations, in-depth answers and diagrams will be appreciated.
 - 4) Mixing of sub-questions is not allowed.

Q. 1 Answer the following questions

(a) Choose the best choice for the following questions: (15M)

- A function f from R to R which satisfies $f(a) = f(b)$ implies $a=b$ for every a and b in R is said to be
 - One-to-one function
 - onto function
 - Either one-to-one or onto function
 - None of these
- A relation R on a set X is such that whenever $(x, y) \in R$, $(y, x) \in R$, then R is called
 - Reflexive
 - Symmetric
 - Transitive
 - None of these
- What is the coefficient of $x^2 y^2$ in the expansion of $(x+y)^4$?
 - 4
 - 6
 - 8
 - None of these
- Suppose a bookcase shelf has 5 Physics texts, 3 Chemistry texts, 6 Biology texts, and 4 Mathematics texts. Number of ways a student can choose one text of each type is given by
 - 660
 - 560
 - 460
 - None of these
- An undirected graph with no multiple edges or loops is called
 - Simple graph
 - Complex graph
 - Tree
 - Pseudo graph

(b) Fill in the blanks for the following questions: (5M)

- A function f such that $f(x) = x$ for any x in the domain of f is said to be a _____ function.
- A relation R on a set A is called _____ if whenever $(a, b) \in R$, then $(b, a) \in R$, for all $a, b \in A$.
- The Gödel number of a word $w = a_5a_2a_3a_1a_2$ is _____.
- The number of different license plates that can be made if each plate contains a sequence of three uppercase English letters followed by three digits is given by _____.
- Let G be a directed graph and v be a vertex of G . The number of edges ending at v is called _____.

(5M)

(c) Answer the following questions:

- (i) If the domain of the function $f(x) = x+1$ is R , what will be its co-domain?
- (ii) Let S be a set. Determine whether there is a greatest element and a least element in the poset $(P(S), \subseteq)$.
- (iii) How many ways are there to select a first-prize winner, a second-prize winner, and a third-prize winner from 100 different people who have entered a contest?
- (iv) Define a regular grammar.
- (v) What is the degree of a vertex of n undirected graph?

(e)

(f)

Q. 2 Answer any three of the following:

(15M)

Q. 4

A
(a)

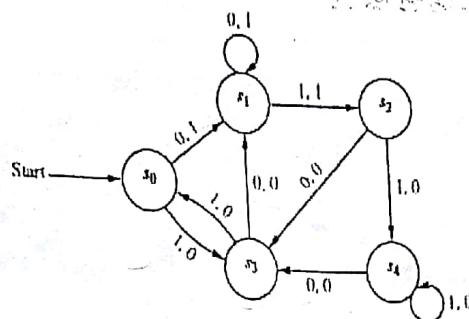
- (a) Determine whether the function $f: R \rightarrow R$ given by $f(x) = -3x + 4$ is a bijection.
- (b) Find the domain and range of following functions:
- (i) The function that assigns to each positive integer the number of the digits 0, 1, 2, 3, 4, 5, 6, 7, 8, 9 that do not appear as decimal digits of the integer.
 - (ii) The function that assigns to a bit string the numerical position of the first 1 in the string and that assigns the value 0 to a bit string consisting of all 0s.
- (c) Draw the Hasse diagram representing the partial ordering $\{(a,b) / a \text{ divides } b\}$ on $\{1, 2, 3, 4, 6, 8, 12\}$.
- (d) Which of these relations on $\{0, 1, 2, 3\}$ are partial orderings?
 - (i) $\{(0,0), (2,2), (3,3)\}$
 - (ii) $\{(0,0), (1,1), (2,0), (2,2), (2,3), (3,3)\}$
- (e) Find a recurrence relation and give initial conditions for the number of bit strings of length n that do not have two consecutive 0s.
- (f) Find the solution of the recurrence relation $a_n = a_{n-1} + 2a_{n-2}$ with $a_0 = 2$ and $a_1 = 7$.

Q. 3 Answer any three of the following:

(15M)

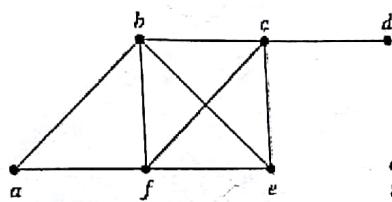
- (a) How many permutations of the letters ABCDEFG contain:
 - (i) The string BCD?
 - (ii) The string CFGA?
 - (iii) The strings BA and GF?
 - (iv) The strings ABC and DE?
 - (v) The strings ABC and CDE?
- (b) State and prove Pascal identity.
- (c) State Pigeonhole principle. A chess player has 77 days to prepare for an important tournament. He decides to practice by playing at least one game per day and a total of 132 games. Show that there is a succession of days during which he must have played exactly 21 games.
- (d) Suppose that there are nine students in a discrete mathematics class at a small college.
 - (i) Show that the class must have at least five male students or at least five female students.
 - (ii) Show that the class must have at least three male students or at least seven female students.

- (e) Construct a derivation tree for the following derivation:
the hungry rabbit eats quickly.
- (f) Find the output string generated by the finite-state machine given below if the input string is 101011.



Q. 4 Answer any three of the following: (15M)

- (a) Find the degree and neighborhood of each of the vertex of the graph given below:



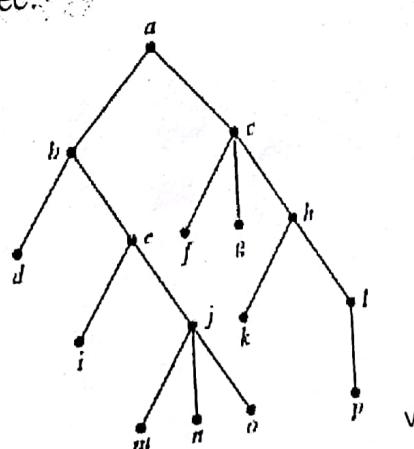
- (b) Suppose a graph G contains two distinct paths from a vertex u to a vertex v . Show that G has a cycle.
(c) Draw the graph corresponding to the following adjacency matrix:

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

- (d) Represent the following expressions using binary tree:
(i) $(x+xy)+(x/y)$; (ii) $x+((xy+x)/y)$.

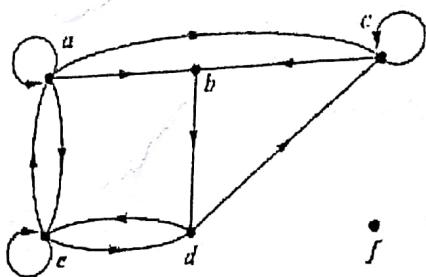
- (e) Draw all possible non similar binary trees T with four external nodes.

- (f) Determine the order in which a preorder traversal visits the vertices of the following ordered rooted tree:

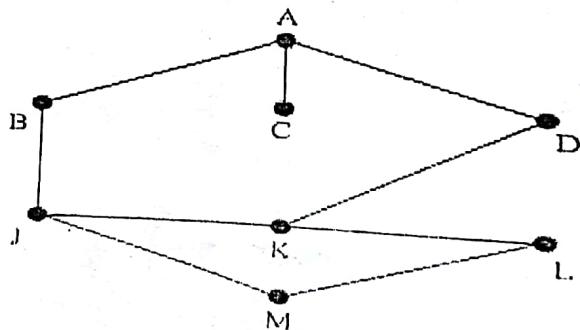


Q. 5 Answer any *three* of the following: (15M)

- (a) Let R be the relation on the set of all people who have visited a particular Web page such that xRy if and only if person x and person y have followed the same set of links starting at a particular Web page. Show that R is an equivalence relation.
- (b) Find the solution of the recurrence relation $a_n = 6a_{n-1} - 9a_n - 2$ with initial conditions $a_0 = 1$ and $a_1 = 6$.
- (c) What is the coefficient of $a^{13}b^{123}$ in the expansion $(a+b)^{25}$ using binomial theorem.
- (d) Define a language L over an alphabet A . Let $A = \{a, b, c\}$. Find L^* where language $L = \{b2\}$.
- (e) Find the in-degree and out-degree of each vertex in the graph shown:



- (f) Consider the graph G in the following figure (where the vertices are ordered alphabetically). (i) Find the adjacency structure of G . (ii) Find the order in which the vertices of G are processed using a Breadth-first search algorithm beginning at vertex A .



Soft Skills Development

Q.P. Code: 23716

(2 1/2 Hours)

[Total Marks: 75]

- N.B. 1) All questions are compulsory.
 2) Figures to the right indicate marks.
 3) Draw suitable diagrams and illustrations wherever necessary.
 4) Mixing of sub-questions is not allowed.

Q.1 Attempt All the Questions**A. Choose the correct alternative**

- _____ thinking enables to have feeling of security and confidence. (5M)
 - Neutral
 - Positive
 - Negative
 - None of these
- _____ is one of the component of non-verbal communication and body language.
 - Sleeping
 - Shouting
 - Facial expression
 - None of these
- Relationship Management is _____ type of competency.
 - Personal
 - Non-personal
 - Social
 - None of these
- The _____ etiquette includes both phone and email etiquette.
 - technology
 - social
 - professional
 - none of these
- _____ is related to coming out with completely new ideas and processes.
 - Creativity
 - Sensitivity
 - Productivity
 - None of these

B. Fill in the blanks (Choose one from the pool) (5M)

{ red hat, black hat, functional, non-functional, Best, Better, defer, deter, interview, discussion}

- _____ is associated with exercising caution; preventing mistakes; being critical; assessing potential danger.
- _____ resume format is important for people who have varied job experiences.
- BATNA refers to _____ alternative to a negotiated agreement.
- The 4 Ds of Email Decision Making include delete, do, delegate and _____.
- _____. _____ is a purposeful talk between two people.

(5M)

- C. Explain the following terms in one or two lines
- Nurturing hobbies at work
 - communication
 - Ideas for Learning
 - Leadership Trends
 - Individual Interview

Q.2 Attempt the following: (Any THREE)

(15M)

- Briefly outline the importance of creativity and motivation.
- Write a note on significance of communication.
- Highlight on the methods of communication in a digital world.
- Write a note on etiquette at meetings.
- Write a note on skills to develop emotional intelligence.
- Write a note on Johari's Window.

Q.3 Attempt the following: (Any THREE)

(15M)

- Briefly describe how to develop a cover letter.
- List and explain in brief the different types of resumes.
- Briefly outline about the measures to coping up with Stage Fright and Anxiety.
- Write a note importance of work ethics.
- Write a short note on using visual aids in presentation.
- Write a note on zones of learning.

Q.4 Attempt the following: (Any THREE)

(15M)

- Write a note on Post-interview Behavior.
- Write a note on Web interview Etiquette.
- What are the steps of decision making? Explain.
- What are the healthier ways to Combat Stress?
- List some important Preparatory steps for Job Interviews.
- Highlight on the important aspects of Group Discussions.

Q.5 Attempt the following: (Any THREE)

(15M)

- List steps of Pre-interview Preparation.
- What are the problems in the absence of work ethics?
- List and explain about the team development stages.
- Write a note on types of group discussion.
- What are the key aspects of informal interview?
