



K. K. Wagh Institute of Engineering Education & Research, Nashik
(An Autonomous Institute From A.Y. 2022-23)

WINTER-2024	
Exam Seat No.:	
Academic Year:2024-2025	Semester:I
Class:PG-I	Program:MCA
Branch Code:M.C.A.	Pattern:2024
Name of Course:Discrete Mathematics	Course Code:2409501
Max. Marks:60	Duration:2.30 Hrs.

Instructions: Candidates should read carefully the instructions printed on the Question Paper and on the cover page of the Answer Book, which is provided for their use.

1. This question paper contains _03_ page(s).
2. Answer to each new question is to be started on a new page.
3. Assume suitable data wherever required, but justify it.
4. Draw the neat labelled diagrams, wherever necessary.
5. The last columns indicates the Course Outcome and level of Blooms Taxonomy of the Question/sub-question.

Marks CO

Question No. 1

- 1a) i) Prove by mathematical induction. (6) CO1

$$2+5+8+\dots+(3n-1)=n(3n+1)/2$$

ii) Consider the following:

P : Anil is rich.

Q : Kanchan is poor.

Write each of the following statements in symbolic form:

- a) Anil is not rich and Kanchan is poor.
- b) It is not true that Anil and Kanchan are both rich.
- c) Either Anil is poor or Kanchan is poor.

Question No. 2

- 2a) i) Define a binary relation and explain its different properties with suitable examples. Explain how these properties are verified for a given relation on a set. (6) CO2

ii) Determine if each is a function? If yes, is it surjective, bijective or injective?

- a. Each person on the earth is assigned a number which corresponds to his age.
- b. Each student is assigned a teacher
- c. Each country has assigned its capital.

Question No. 3

- 3a) Out of 4 officers and 10 clerks, a committee of 2 officers and 3 clerks is to be formed. In how many ways committee can be formed if: (8) CO3
- i) Any officer and any clerk can be included
 - ii) A particular clerk must be in committee

OR

- 3b) Find the number of ways of arranging the letters of the word "TENNESSEE" at a time (8) CO3
- i) if there is no restriction
 - ii) if the first two letters must be "E"
- 3c) A woman has 11 friends: (8) CO3
- i) In how many ways can she invite five of them for dinner?
 - ii) In how many ways if two of them are married and will not attend separately?

OR

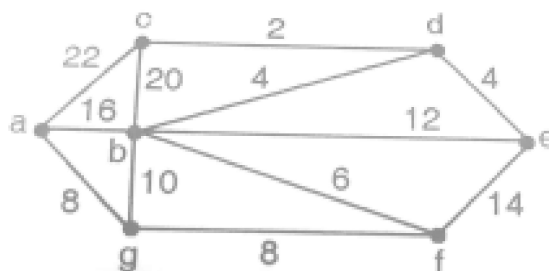
- 3d) How many 3-digit numbers can be formed using the digits 2,3,4,5,7 and 9, if the repetition of digits is not allowed? (8) CO3
- i) How many of these numbers are less than 400?
 - ii) How many are even?
 - iii) How many are multiples of 5?
 - iv) How many are odd?
 - v) How many are multiples of 10?

Question No. 4

- 4a) Explain following with diagram (8) CO4
- i) Weighted Graph
 - ii) Bipartite Graph
 - iii) Minimum Spanning Tree
 - iv) Directed Graph

OR

- 4b) i) Show that a complete graph with n vertices consists of $n(n-1)/2$ edges. (8) CO4
- ii) Find number of edges in a graph with 6 nodes, 2 of degree 4 and 4 of degree 2. Draw such graph.
- 4c) Find the shortest path for a to e in the following graph using Dijkstra's Shortest Path Algorithm: (8) CO4

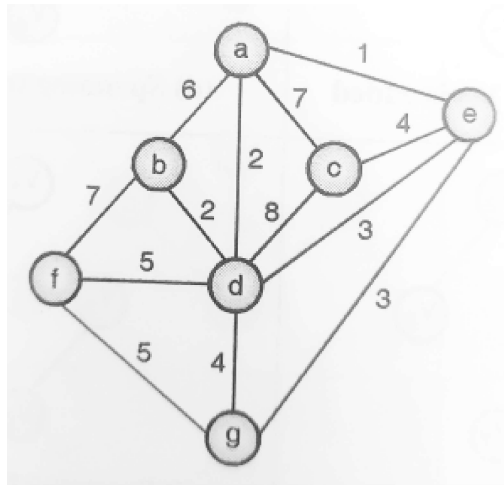


OR

- 4d) Explain Graph isomorphism with diagram. Draw all non-isomorphic graphs on 2 and 3 vertices. (8) CO4

Question No. 5

- 5a) Use Kruskal's algorithm to find the minimum Spanning tree of the graph given below (8) CO5

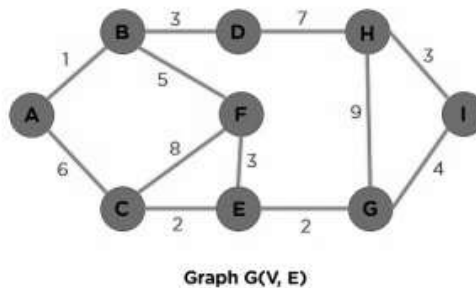


OR

- 5b) Create Binary search tree generated by inserting integers in order 50,15,62,5,20,58,91,3,8,37,60,24 (8) CO5
- 5c) What is optimal binary tree? State and explain the Huffman Code to find the optimal binary tree for the weights 8, 9, 10, 11, 13, 15, 22. Also generate the optimal prefix code. (8) CO5

OR

- 5d) Use Prim's algorithm to find the minimum spanning tree of the graph shown below: (8) CO5



Graph $G(V, E)$

..... End of question paper.....