

**MASTER IN COMPUTER
APPLICATIONS (MCA-NEW)**

Term-End Examination

June, 2026

**MCS-211 : DESIGN AND ANALYSIS OF
ALGORITHMS**

Time : 3 Hours

Maximum Marks : 100

Weightage : 70%

Note : *Question No. 1 is compulsory. Attempt
any **three** questions from the rest.*

1. (a) Describe the steps involved in Euclid's algorithm to find the GCD of two integers. Use the algorithm to find the GCD of 252 and 105. 5
- (b) Solve the following recurrence relation using Recurrence Tree Method : 5

$$T(n) = \begin{cases} 1 & \text{if } n = 1 \\ T\left(\frac{n}{2}\right) + 2 & \text{if } n > 1 \end{cases}$$

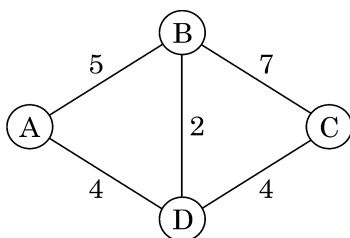
- (c) What are the differences between Big 'O' and Big ' Ω ' notations ? Explain with examples. 5
- (d) What is NP class of problems ? Explain with the help of an example. 5
- (e) Find an optimal parenthesization of a matrix-chain product whose sequence of dimensions is as follows : 6

Matrix	A_1	A_2	A_3	A_4
Dimension	10×15	15×25	25×8	8×13

- (f) Given the three key values of binary search tree : 10, 50, 100; how many binary search trees are possible for these key values. Draw all these binary search trees. 6

(g) Explain the vertex cover problem of a graph. 4

(h) Use the Kruskal's algorithm to find the minimum cost spanning tree for the following graph : 4



2. (a) What is Merge sort ? Write all the steps to sort the given sequence of numbers :

11, 15, 2, 6, 14, 10, 8, 7, 5, 19, 4 using Merge sort. 12

(b) Write the binary search algorithm. Show the best case, worst case and the average case of binary search. 8

3. (a) Find the optimal solution to the following instance of a fractional knapsack problem. Number of objects = 5, Capacity of a knapsack $W = 15$, P_i = Profit of an object i , W_i = Weight of an object i .

$$(P_1, P_2, P_3, P_4, P_5) = (15, 30, 40, 35, 55)$$

$$(W_1, W_2, W_3, W_4, W_5) = (5, 9, 3, 7, 2) \quad 10$$

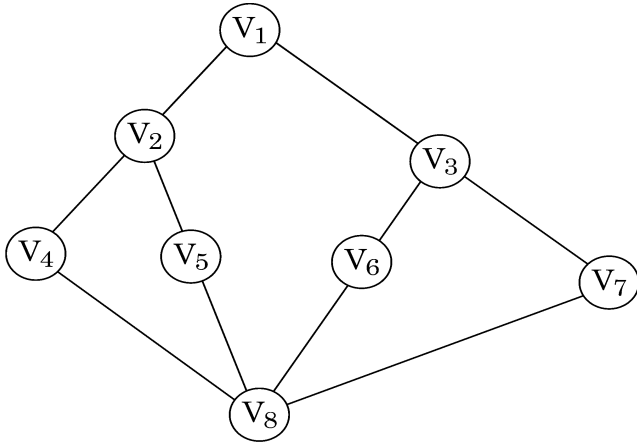
- (b) Evaluate the polynomial

$$p(x) = 5x^5 + 4x^4 - 3x^3 - 2x^2 + 9x + 11$$

at $x = 3$ using Horner's rule. Analyze the computation using Horner's rule against the Brute Force method of polynomial evaluation. 10

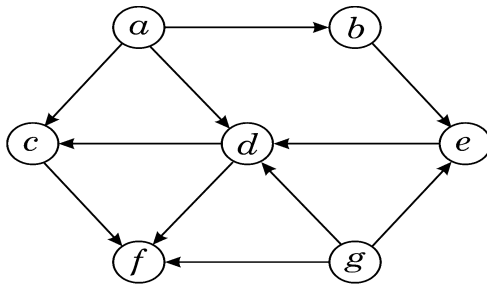
4. (a) Apply the DFS algorithm to the following graph with the starting vertex

V_1 . List the order in which vertices will be visited. 10



Also, represent the above graph using :

- (i) Adjacency list and
 - (ii) Adjacency matrix
- (b) Define topological sorting of a graph and perform topological sorting of the following graph : 10



5. (a) Describe the Rabin-Karp algorithm for string matching. Compare its performance with the Naive string matching algorithm. 10
- (b) Construct an optimal Huffman tree and Huffman code for the following set of frequencies of characters : 10
- A : 20, B : 25, C : 10, D : 8, E : 7, F : 12, G : 10

Show all the intermediate steps.

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