No. of Printed Pages : 7

MCS–211

MASTER OF COMPUTER APPLICATIONS

(MCA–NEW)

Term-End Examination

December, 2025

MCS–211 : DESIGN AND ANALYSIS OF ALGORITHMS

Time : 3 Hours *Maximum Marks : 100*

Weightage : 70%

Note : *Question No.* ***1*** *is compulsory and carries 40 marks. Attempt any* ***three*** *questions from the rest.*

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1. (a) Apply merge sort algorithm to sort the following array elements : 5

4, 6, 2, 3, 8, 5, 7, 1

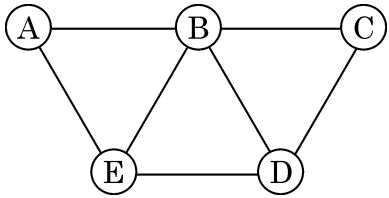
(b) Explain the Horner's method of polynomial evaluation with the help of an example. What is the time complexity of this method ? 5

(c) Build the Huffman tree for the following data : 5

Character	Frequency
a	70
b	2
c	5
d	13
e	3
f	7

(d) Make all possible binary search trees consisting of three keys 10 50 90. 5

(e) Consider the following graph : 5

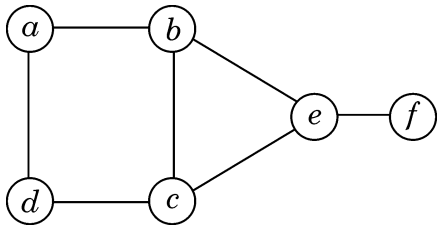


Represent this graph using adjacency list.

(f) Explain the Kruskal's-algorithm for Minimum Spanning Tree (MST) construction. 5

(g) What is Boolean Satisfiability (SAT) problem ? Explain in detail. 5

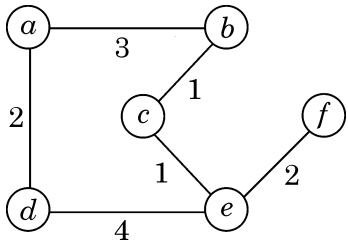
(h) Using Breadth First Search (BFS), traverse the following graph by using 'a' as the starting node : 5



2. (a) Write the principle of optimality. Explain how dynamic programming can be used to solve chain matrix multiplication problem. 10

(b) Define a fractional Knapsack problem as an optimization problem. Write a Greedy method to find an optimal solution to the problem. Find the complexity of the algorithm. 10

3. (a) Write Dijkstra's algorithm and use it to find the minimum distances of all the nodes from node '*a*' which is taken as the source node for the following graph : 10

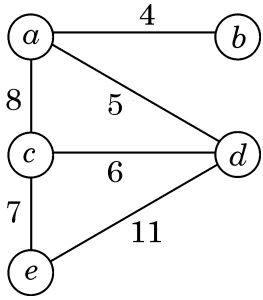


(b) Write the quick sort algorithm. Also find the worst case complexity of this algorithm. Use this algorithm for sorting the following list : 10

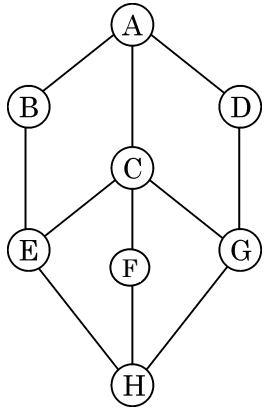
20, 5, 15, 8, 6, 28

4. (a) Write Prim's algorithm to find Minimum Spanning Tree (MST). Use

Prim's algorithm to find MST for the graph given below : 10



(b) Write DFS and BFS algorithms. Also determine the time complexity of DFS and BFS algorithms. For the given graph, write DFS traversal sequence from node 'A' : 10



5. (a) Explain the class P, NP and NP-complete problem. Give *one* example for each class. 8

(b) Write short notes on the following : 4×3=12

(i) Backtracking

(ii) Branch and Bound

(iii) Approximation algorithms

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