U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

August 2024 Supplementary Examinations

Programme: B E **Semester: IV**
Branch: Artificial Intelligence and Machine Learning **Duration: 3 hrs.**
Course Code: 20AM4PCDAA **Max Marks: 100**
Course: Design and Analysis of Algorithms

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

UNIT - I

1 a) Discuss the Worst case, Best case and average case time complexity of an algorithm with an example. **8**

b) Solve the following recurrence relation using backward substitution method **6**

i. $x(n)= x(n/2)+n$ for $n>1$, $x(1)=1$

ii. $x(n)=x(n-1)+5$ for $n>1$ and $x(0)=0$

c) Differentiate among O-notation, Ω-notation and θ-notation **6**

UNIT - II

2 a) Apply Exhaustive Search technique to solve the Knapsack problem for the following instance: Number of objects N=4, weights = {10,20,16,24) and profits = {85,40,35,30} with the capacity of Knapsack M=50. **6**

b) Apply Quick sort technique to sort the following set of integers. Also, write Quick sort algorithm to sort an array and find its time complexity in worst case **8**

60, 50, 25,10,35,25,75,30,85

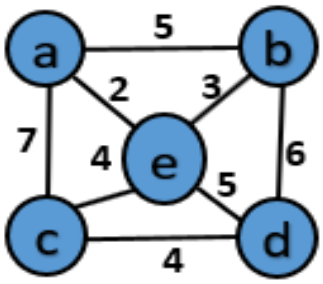
c) Explain Spanning tree and Minimum Spanning tree with an example for each. **6**

OR

3 a) Apply Merge sort technique to sort the following set of integers. Also, write Merge sort algorithm to sort an array and find its time complexity in worst case **8**

38,27,43,3,9,82,10

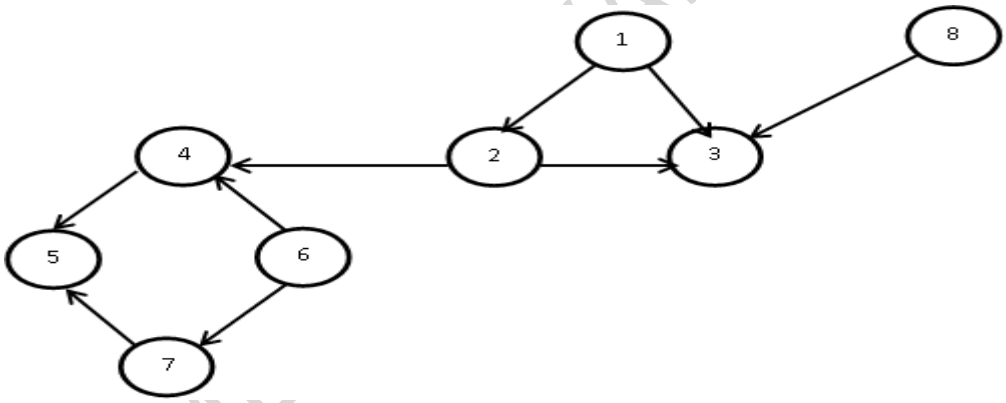
b) Write Kruskal's algorithm and find the minimum spanning tree for the following graph. **8**



c) Write an algorithm to sort an array by selection sort technique **4**

UNIT - III

4 a) Apply Decrease and Conquer technique to find Topological order for the following graph using DFS method with the source vertex '1' and write an algorithm for the same. **8**



b) Generate permutations for the following set using Johnson Trotter method (1,2,3,4} **6**

c) Construct a shift table and find whether pattern string is present in the text string using Horspool string matching algorithm **6**

Text: JIMY_HAILED_THE_LEADER_TO_STOP

Pattern: LEADER

OR

5 a) Differentiate between DFS and BFS tree traversals. **6**

b) Write an algorithm to find topological order for a graph using DFS method. **6**

c) Differentiate between linear probing and quadratic probing with an example. Consider the hash table with the current status and hash key=Key % 11. Explain the situation when a key element 87 is inserted and which position it will be inserted in the below hash table **8**

Index	Value
0	43
1	
2	46
3	25
4	36
5	
6	
7	18
8	29
9	
10	10

UNIT - V

6 a) Create a max heap tree for the following list of elements. Show step-by-step construction of tree and sorting of the elements. **6**

55, 28, 35, 78, 110, 48, 88

b) Write an algorithm to determine the mode using the concept of presorting and analyze its time complexity. **6**

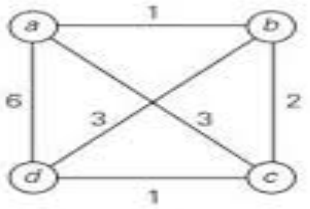
c) Compute binomial co-efficient for n=5 and k=4 using dynamic programming. Also, develop an algorithm and write its time complexties. **8**

OR

7 a) Distinguish between P, NP and NP completeness problem **6**

b) Apply backtracking approach to write state space tree to find sum of subsets for set S={5, 5, 10} and d=10 **6**

c) Apply branch and bound technique to solve the travelling salesman problem for the below graph. **8**



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