

S.E / sem-III / NEP / DEC-25 / ET / O.P. Code-: 99290

19/12/15
1/2

Duration: 2hrs

[Max Marks: 60]

- N.B.: (1) Question No 1 is Compulsory.
 (2) Attempt **any three** questions out of the remaining five.
 (3) All questions carry equal marks.
 (4) Assume suitable data, if required, and state it clearly.

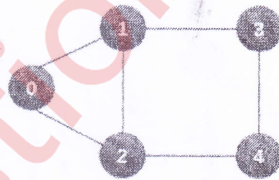
1 Attempt any **THREE** [15]

- a Define time complexity and space complexity. Explain the difference between worst-case, average-case, and best-case complexity.
 b Define an AVL tree. Explain the concept of rotations in AVL trees.
 c Find Minimum Spanning Tree of the following undirected graph using Prim's Algorithm.
 Cost (1, 2) = 250, Cost (1, 3) = 180, Cost (1, 4) = 100,
 Cost (2, 3) = 50, Cost (2,5) = 10, Cost (3, 4) = 20, Cost (4, 5) = 40
 d Describe the graph coloring problem with example.

2 a What is "Master Theorem" in recurrence relation. Find the complexity of following recurrence relation using Master Theorem. [07]

$$T(n) = 4T(n/2) + n^3$$

- b Given a graph, apply BFS and DFS traversals on it with corresponding data structure implementation. [08]



3 a Given n=7 items with profits p={10,5,15,7,6,18,3}, weights w={5,2,3,5,7,2,4}, and knapsack capacity m=15, solve the fractional knapsack problem using the greedy profit/weight ratio rule and report the optimal total profit and the fraction of each item selected (x₁, ..., x₇). [07]

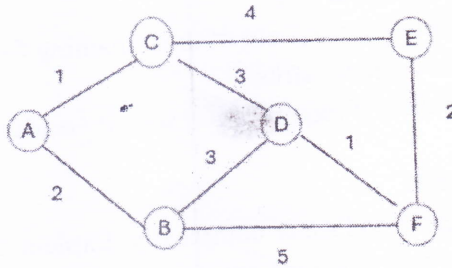
- b Given a weighted directed graph with 4 vertices, apply the Floyd-Warshall's algorithm to compute the all-pairs shortest path matrix. [08]

From / To	1	2	3	4
1	0	3	∞	7
2	8	0	2	∞
3	5	∞	0	1
4	2	∞	∞	0

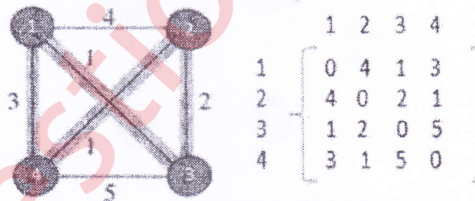
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- 4 a Using Dijkstra's Algorithm to determine the shortest path from source node A to destination node F. Show the detailed working. [07]



- b Explain the backtracking solution for the N-Queens problem. [08]
Draw the partial state-space tree for N = 4 and show all valid configurations.
- 5 a Solve the Sum of Subsets problem for the set $S = \{2, 4, 6, 8\}$ with target sum = 10 using backtracking. Show the state-space tree and include bounding steps. [07]
- b Explain KMP (Knuth-Morris-Pratt) algorithm. Then use this to perform pattern matching on the text $T = \text{"BACBABABACACA"}$ and pattern $P = \text{"ABABACA"}$. [08]
- 6 a Solve the given Travelling Salesperson Problem using Dynamic Programming. [07]



- b Explain the naive string-matching algorithm. For text $T = \text{"ABABABC"}$ and pattern $P = \text{"ABC"}$, show all character comparisons clearly. [08]
