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PAPER CODE	U313-291 ESE

December 2023 (ENDSEM) EXAM

TY (SEMESTER - I)

COURSE NAME: Design and Analysis of Algorithms

Branch: Electronics and Telecommunication

COURSE CODE: ES31201ET

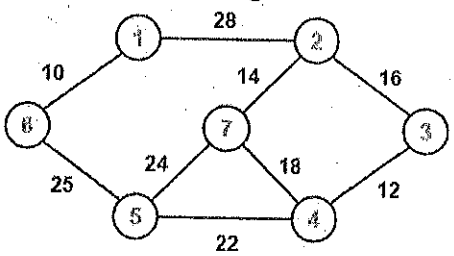
(PATTERN 2020)

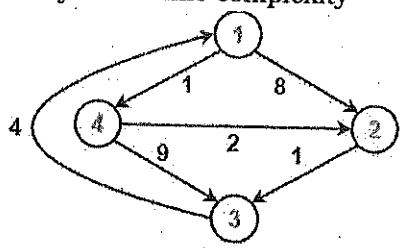
Time: [1Hr. 30 Min]

[Max. Marks: 40]

(*) Instructions to candidates:

1) **Figures to the right indicate full marks.**
2) **Use of scientific calculator is allowed**
3) **Use suitable data wherever required**
4) **All questions are compulsory. Solve any one sub question from Question 3 and any two sub questions each from Questions 4,5 and 6 respectively.**

Q. No.	Question Description	Max. Marks	CO mapped	B T Level
Q.1	a) Apply master theorem to binary search algorithm and determine the time complexity.	[2]	1	Apply
Q2	a)An array [2, 5, 3, 1, 8] is to be sorted in ascending order using heap sort algorithm. Illustrate the construction of heap and sorting procedure after each step.	[2]	2	Apply
Q3.	**a)**A networking company uses a Huffman coding technique to encode the message before transmitting over the network. The message contains following characters with their frequency. (a: 5), (b: 9), (c: 12), (d: 13), (e: 16), (f: 45) Determine the total number of bits of the encoded message.	[6]	3	Apply
	b) Construct the minimum spanning tree (MST) for the given graph using Prim's Algorithm, starting from node 1. Hence determine the minimum cost of the tree. State the time complexity of the algorithm.  	[6]	3	Apply
Q.4	**a)** i) In ICC World Cup tournament, 10 countries are playing. In league matches, each country has to play with every other country in order qualify for semifinals. Determine the number of league matches played using binomial expansion formula.	[5]	4	Apply

	ii)Ram has infinite coins of denominations 5, 10 and 20. Using these denominations, how many number of ways can Ram generate a sum of 30. Also write all the combinations. **b)**A vegetable seller has to fetch the vegetables to the market in a sack with maximum capacity of 8 Kg. There are following items with their weights and profits. Items | 1 | 2 | 3 | 4 Weights Kg | 5 | 6 | 4 | 3 Profit Rs | 50 | 30 | 32 | 27 You are required to help the seller to select the items which will fetch him maximum profit. Hence, use dynamic programming method to determine M(2,7) Analyze the time complexity of the algorithm. **c)** Using Floyd Warshall Algorithm, to determine A2 matrix. Analyze the time complexity  	[5] [5]	5 5	Apply and Analyze Apply and Analyze
Q.5	**a)** Demonstrate how backtracking can be used to arrange three colors R,G, B in maximum possible combinations. **b)**Solve a n queens problem where the integer n is 4. Show all the possible solutions no two queens can lie in the same row, same column or same diagonal of a 4*4 chess board. **c)**Solve the given knapsack problem using branch and bound. Capacity of the sack is 8 i | 1 | 2 | 3 | 4 P | 10 | 10 | 12 | 18 W | 2 | 4 | 6 | 9	[5] [5] [5]	5 5 5	Apply Apply Apply
Q.6)	**a)** Justify how multiplication of two matrices can be reduced to squaring of a matrix. **b)** Apply non deterministic algorithm for searching a record from given database. **c)** Prove that a clique optimization problem reduces to the clique decision problem.	[5] [5] [5]	6 6 6	Apply Apply Analyze