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| PRN No. | |
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| PAPER CODE | U315-291 CRE |
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(AY:2025-26) December 2025 (ENDSEM) EXAM

TY/B.TECH (SEMESTER - I)

COURSE NAME: Design and Analysis of Algorithms
Branch: E & TC

COURSE CODE:

ETUA31231

T.Y (Pattern 2023)

Time: [1Hr 30 Min]

[Max. Marks: 40]

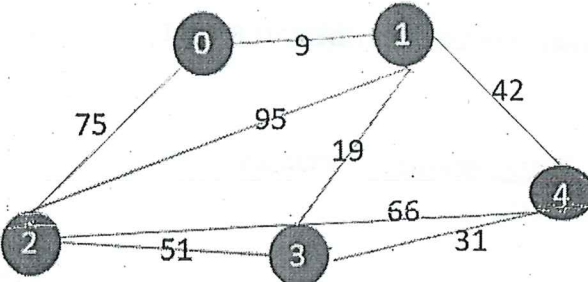
(*) Instructions to candidates:

1) Figures to the right indicate full marks. Use of scientific calculator is allowed

2) Use suitable data wherever required

3) All questions are compulsory. Solve any two sub question each from Questions 1, 2, 3 and 4

| Q. No. | Question Description | Max. Marks | CO mapped | BT Level |
|--------|---|------------|-----------|----------|
| Q1 | a) Analyze a simple algorithm and determine whether it satisfies the essential characteristics of a valid algorithm. | [5] | 1 | Analyze |
| | b) Solve following two recurrence relations using Master Theorem. $T(n) = 2T\left(\frac{n}{2}\right) + n \log n$ $T(n) = 4T\left(\frac{n}{2}\right) + n$ | [5] | 1 | Analyze |
| | c) State whether following expressions are true or false 1. $O(n^3)$ is not $O(n^2)$ 2. $\Omega(n^3)$ is $\Omega(n^2)$ | [5] | 1 | Analyze |
| Q2 | a) Insert the following numbers into an initially empty max-heap: 12, 6, 15, 2, 9, 20. Show the heap after each insertion step. | [5] | 2 | Analyze |

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|----|--|-----|---|------------|
| | <p>b) Develop a minimum spanning tree for following graph using Prim's algorithm starting from vertex 0</p>  <p>c) Find maximum profit by solving following Knapsack problem using greedy approach. Input: val [] = [60, 100, 120], wt[] = [10kg, 20kg, 30kg] capacity = 50</p> | [5] | 2 | Analyze |
| Q3 | <p>a) A library received 7 new books and needs to display 4 of them on the "New Arrivals" shelf. Use the formula for combinations to determine how many different groups of books can be selected. List three of the possible selections.</p> <p>b) A bank teller needs to dispense change. They have an unlimited supply of Indian coins with the following denominations: 1, 4 and 6. Question: What is the minimum number of coins required to make a total change amount of 9? Solve using Dynamic programming</p> <p>c) Using the backtracking technique, place 4 queens on a 4×4 chessboard such that no two queens attack each other.</p> <ol style="list-style-type: none"> 1. Draw the chessboard and show step-by-step how the queens are placed. 2. Identify which positions are backtracked during the process. <p>Remember that queens cannot share the same row, column, or diagonal.</p> | [5] | 3 | Apply |
| | | [5] | 3 | Apply |
| Q4 | <p>a) Define Tractable and Intractable Problem</p> <p>b) Compare P problems with NP problems.</p> <p>c) Prove that CLIQUE DECISION PROBLEM (CDP) is NP Hard Problem</p> | [5] | 4 | Understand |
| | | [5] | 4 | Understand |
| | | [5] | 4 | Understand |