



**B.E/B.TECH DEGREE EXAMINATIONS: NOV / DEC 2024**

(Regulation 2018)

Fourth Semester

**COMPUTER SCIENCE AND ENGINEERING**

U18CST4001: Design and Analysis of Algorithms

**COURSE OUTCOMES**

- CO1: Compare various graph traversal techniques.
- CO2: Apply algorithm analysis techniques for a given algorithms.
- CO3: Examine algorithm design techniques for a given application.
- CO4: Analyse different algorithms for solving a given problem.
- CO5: Develop application using chosen algorithm technique.

**Time: Three Hours**

**Maximum Marks: 100**

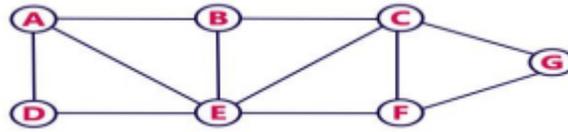
**Answer all the Questions:-**

**PART A (10 x 2 = 20 Marks)**  
**(Answer not more than 40 words)**

- |  |                       |
|--|-----------------------|
| 1. Define transitive closure of directive graph.                       | CO1 [K <sub>1</sub> ] |
| 2. Define the terms Degree, indegree and outdegree of a graph.         | CO1 [K <sub>1</sub> ] |
| 3. List the fundamental steps involved in algorithmic problem solving. | CO2 [K <sub>1</sub> ] |
| 4. Mention some of the important problem types.                        | CO2 [K <sub>2</sub> ] |
| 5. Define the term string matching.                                    | CO3 [K <sub>2</sub> ] |
| 6. Show the recurrence relation of divide-and-conquer method.          | CO3 [K <sub>3</sub> ] |
| 7. What is Optimal Binary Search Tree?                                 | CO4 [K <sub>1</sub> ] |
| 8. Difference Between Greedy and Dynamic Programming.                  | CO4 [K <sub>2</sub> ] |
| 9. Define Graph Coloring problem.                                      | CO5 [K <sub>1</sub> ] |
| 10. Outline the cost matrix in assignment problem.                     | CO5 [K <sub>2</sub> ] |

**Answer any FIVE Questions:-**  
**PART B (5 x 16 = 80 Marks)**  
**(Answer not more than 400 words)**

11. a) Construct an algorithm using depth first search algorithm and breadth first algorithm. 16 CO1 [K<sub>3</sub>]



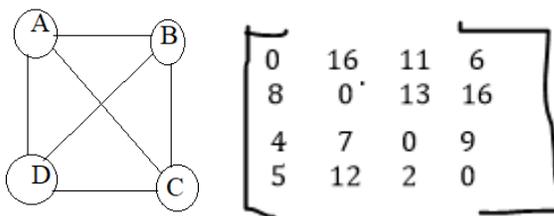
12. a) Solve the recurrence equation:  $T(1) = 1$  and  $T(n) = 2T(n/2) + n$  for  $n > 1$ ? 8 CO2 [K<sub>3</sub>]
- b) Solve the following recurrence by using recursion tree method. 8 CO2 [K<sub>3</sub>]  
 $n T(n) = 2T(n/2) + n$

13. a) Apply Strassen's matrix algorithm to compute. 8 CO3 [K<sub>3</sub>]
- $$\begin{bmatrix} 3 & 5 \\ 4 & 6 \end{bmatrix} \times \begin{bmatrix} 2 & 7 \\ 8 & 3 \end{bmatrix}$$

- b) Explain in detail about sequential search algorithm with example. 8 CO3 [K<sub>2</sub>]

14. Find the optimal solution of the Knapsack instance  $n=7$ ,  $M=15$ ,  $(p_1, p_2, \dots, p_7) = (10, 5, 15, 7, 6, 18, 3)$  and  $(w_1, w_2, \dots, w_7) = (2, 3, 5, 7, 1, 4, 1)$ . 16 CO4 [K<sub>3</sub>]

15. a) Solve the following 4 city travelling salesperson problem using Branch and Bound algorithm. 10 CO5 [K<sub>3</sub>]



- b) Difference between NP-Hard and NP-Completeness with example? 6 CO5 [K<sub>2</sub>]

16. a) Find the solution generated by the job sequencing with deadlines,  $N = 7$ . 10 CO5 [K<sub>2</sub>]  
 $(p_1, p_2, p_3, p_4, p_5, p_6, p_7) = (3, 5, 20, 18, 1, 6, 30)$   
 $(d_1, d_2, d_3, d_4, d_5, d_6, d_7) = (1, 3, 4, 3, 2, 1, 2)$

- b) Draw the 4-Queens state space tree 6 CO5 [K<sub>1</sub>]

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