M.Sc. IV SEMESTER [MAIN/ATKT] EXAMINATION MAY - JUNE 2025

COMPUTER SCIENCE
Paper - II
[Design and Analysis of Algorithm]

[Max. Marks : 75]   *[Time : 3:00 Hrs.]*   *[Min. Marks : 26]*

Note : Candidate should write his/her Roll Number at the prescribed space on the question paper.
Student should not write anything on question paper.
Attempt all five questions. Each question carries an internal choice.
Each question carries **15 marks.**

Q. 1 a) Define and differentiate Big-O, Big-Omega and Big-Theta notations with appropriate example.

b) Explain Binary Search Algorithm. How is it better than Linear Search.

OR

a) Write the complete algorithm for quick sort. Calculate its time complexity in worst, best and average case.

b) Explain master theorem for solving recurrence relation and describe the different case of the theorem in detail with example.

Q. 2 a) Find optimal solution for 0/1 Knap sack problem $(w_1, w_2, w_3, w_4) = (10, 15, 6, 9)$, $(p_1, p_2, p_3, p_4) = (2, 5, 8, 1)$ and $M = 30$

b) Explain assembly line scheduling algorithm using dynamic programming with example.

OR

a) Describe the weighted interval scheduling problem and provide a dynamic programming with example.

b) Find an optimal parenthesization of matrix chain product whose sequence of dimensions is $(5, 10, 3, 12, 5, 50, 6)$

Q. 3 a) What is fractional knapsack problem find the optimal solution to the knapsack instance $n = 3$, $m = 20$.
$(p_1, p_2, p_3) = (25, 24, 15)$ and $(w_1, w_2, w_3) = (18, 15, 10)$

b) Compare and contrast greedy and dynamic programming approaches for optimization problem.

OR

a) What are the characteristics of problems that can be solved by the greedy method ? Explain with example.

b) Describe the Task Scheduling Problem using the Greedy Method with suitable example.

Q. 4 a) Write Dijkstra is algorithm with the help of an example. Also compute the running time of it.

b) Describe BFS and DFS algorithm with suitable example.

OR

a) Write Floyd-Warshall algorithm to solve all pair shortest path problem.

b) What are the difference between Prim's algorithm and Kruskal algorithm for finding the minimum spanning tree of a graph.

Q. 5 a) Define class P and NP. Explain with example and discuss the relation between P and NP.

b) Explain approximation algorithm. Describe approximation algorithm for the vertex cover problem.

OR

a) Differentiate between deterministic and non deterministic polynomial time algorithm.

b) What are NP-Hard and NP- Complete Problem ? Explain the concept with appropriate example.

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