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M.Sc. 1st Semester Examination
Subject: Computer Science
Coursecode: COS-103(Design & Analysis of Algorithm)
FM= 40 marks

1. Answer any four out of six questions from the followings: 2×4=8

- a) Explain complexity of an algorithm.
- b) Differentiate between traceable and untraceable problems.
- c) Quick sort is a nin-place sort: Justify.
- d) “Huffman code is an o prefix code” Explain.
- e) Discuss divide and concur strategy with example.
- f) “Back tracking reduces the solutions pace for a problem.”Justify.

2. Answeranyfouroutofsixquestionsfromthefollowing: 4x4=16

- a) Solve the recurrence using the Master Theorem: $T(n)=3T(\frac{n}{4})+n\log n$.Determine the overall time complexity.
- b) Given items for 0–1Knapsack:Weights={2,3,4},Values={4,5,6},Capacity=5.Construct The DPtable and find the maximum value.
- c) Write short notes on: (a)PvsNP (b)NP-hard problems.
- d) Explain the working principle of recursive Merge Sort. Draw there cursion tree for the input [38,27,43,3,9,82,10]State its time and space complexity.
- e) Explain the Travelling Salesman Problem (TSP) and its justification for inclusion in NP-Hard category.

Given the following distance matrix, use the near est neighbor heuristic starting from city Ato construct an approximate tour and compute its total cost.

	A	B	C	D
A	0	10	15	20
B	10	0	35	25
C	15	35	0	30
D	20	25	30	0

Explain each step clearly and finally compare how the heuristic solution differs from an optimal tour.

- f) Define Greedy Algorithm.Explain the Activity Selection Problem using the greedy approach. Why does choosing the activity with the earliest finishing time always lead to an optimal solution?

3. Answer any two out off our questions from the following: 2x8=16

- a) Consider the following weighted directed graph:

Edge	A→B	A→C	B→C	B→D	C→E	E→D	D→F	E→F
Weight	4	2	5	10	3	4	11	5

Apply Dijkstra’s Algorithm with A as the source. Write the final shortest path tree and shortest Distances from A to all vertices.

- b)** For the following chain of matrices: $A_1(10 \times 5)$, $A_2(5 \times 20)$, $A_3(20 \times 12)$, $A_4(12 \times 8)$ Construct the cost table(m), split table(s). Write the final parenthesization and compute the minimum number of scalar multiplications.
- c)** Write and explain the algorithm for the generation of MST by: i)Prim's ii)Kruskal. Also find time and space complexity.
- d)** Formulate a solution to the N-queen's problem by using backtracking method.