CBCS SCHEME

USN | | | | | | | | | | **18CS42**

Fourth Semester B.E. Degree Examination, Dec.2024/Jan.2025

Design and Analysis of Algorithm

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Define Algorithm. Explain asymptotic notations Big O, Big Omega and Big theta notations with example. **(10 Marks)**

b. Explain general plan of mathematical analysis of non-recursive algorithms with example. **(10 Marks)**

OR

2 a. Illustrate mathematical analysis of recursive algorithm for towers of hanoii. **(08 Marks)**

b. Define time and space complexity. Explain important problem types. **(12 Marks)**

Module-2

3 a. Write the algorithm for recursive binary search and find efficiency for all three cases. **(10 Marks)**

b. Explain divide and conquer technique. Write an algorithm for merge sort. **(10 Marks)**

OR

4 a. Illustrate the tracing of quick sort algorithm for the following set of numbers :
50, 10, 25, 30, 15, 70, 35, 55 **(10 Marks)**

b. Explain decrease and conquer technique. Illustrate the topological sorting for the following graph : **(10 Marks)**

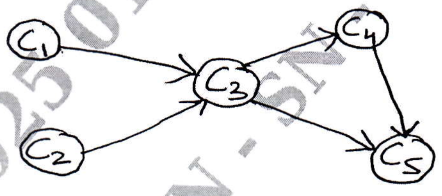

Fig. Q4 (b)

Module-3

5 a. Explain the concept of greedy method. Write a Kruskal's algorithm to find minimum cost spanning tree. **(10 Marks)**

b. Solve the following single source shortest path problem assuming vertex '1' as the source. **(10 Marks)**

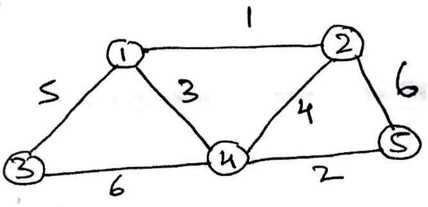

Fig.Q5 (b)

OR

6 a. Sort the given list of numbers using heap sort : 2, 9, 7, 6, 5, 8 **(10 Marks)**

b. Construct a Huffman tree and resulting code word for the following :

Char	A	B	C	D	E	-
Probability	0.5	0.35	0.5	0.1	0.4	0.2

Encode the text DAD. Decode the text whose encode is 1100110110. **(10 Marks)**

Module-4

7 a. Explain the concept of dynamic programming. Using Floy'ds algorithm. Solve the all pair shortest problem for the graph whose weight matrix is given below :

$$\begin{bmatrix} 0 & \infty & 3 & \infty \\ 2 & 0 & \infty & \infty \\ \infty & 7 & 0 & 1 \\ 6 & \infty & \infty & 0 \end{bmatrix}$$

(12 Marks)

b. Write multistage graph algorithm to forward approach. **(08 Marks)**

OR

8 a. Write an algorithm for Bellman-Ford algorithm. **(10 Marks)**

b. Solve the following instance of Knapsack problem using dynamic programming. Knapsack capacity is 5. **(10 Marks)**

Item	1	2	3	4
Weight	2	1	3	2
Value	\$12	\$10	\$20	\$15

Module-5

9 a. Explain backtracking method. Illustrate 4-queens problem using backtracking method. And also write another solution. **(10 Marks)**

b. Solve subset sum problem for the following example, S = {3, 5, 6, 7} and d = 15. Construct a state space tree. **(10 Marks)**

OR

10 a. Explain branch and bound method. Solve assignment problem for the following :

$$\begin{array}{cc|cccc|} & & J_1 & J_2 & J_3 & J_4 \\ & a & 9 & 2 & 7 & 8 \\ \text{Person} & b & 6 & 4 & 3 & 7 \\ & c & 5 & 8 & 1 & 8 \\ & d & 7 & 6 & 9 & 4 \end{array}$$

(10 Marks)

b. With the help of a state space tree, solve following instance of the knapsack problem the FIFO branch and bound method. The knapsack capacity is 15.

Item	1	2	3	4
Weights	2	4	6	9
Values	10	10	12	18

(10 Marks)

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