

## 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 hanoi. (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)

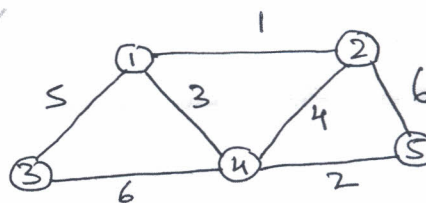


Fig.Q5 (b)  
1 of 2

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

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 :

0	$\infty$	3	$\infty$
2	0	$\infty$	$\infty$
$\infty$	7	0	1
6	$\infty$	$\infty$	0

(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 :

	$J_1$	$J_2$	$J_3$	$J_4$
a	9	2	7	8
Person b	6	4	3	7
c	5	8	1	8
d	7	6	9	4

(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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