USN ☐☐☐☐☐☐☐☐☐☐

18CS42

Fourth Semester B.E./B.Tech. Degree Examination, June/July 2025
Design and Analysis of Algorithms

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 its characteristics.   **(05 Marks)**
    b.   Define space complexity and time complexity of an algorithm and compute the time complexity of Fibonacci numbers algorithm.   **(05 Marks)**
    c.   What are the various basic Asymptotic efficiency classes? Explain Big - O, Big - Ω, Big - θ notations with examples.   **(10 Marks)**

OR

2   a.   Give the mathematical analysis of non recursive matrix multiplication algorithm.   **(05 Marks)**
    b.   Mention the important problem type considered for design and analysis. Explain any two problem types.   **(05 Marks)**
    c.   Give the general plan for analyzing time efficiency of recursive algorithms and also analyze the tower of Hanoi recursive algorithm.   **(10 Marks)**

Module-2

3   a.   Discuss the general method of divide and conquer along with control abstraction.   **(06 Marks)**
    b.   Write an algorithm for Merge sort. Also demonstrate the applicability of Master's theorem to compute the time complexity of merge sort.   **(06 Marks)**
    c.   Sort the below given array of elements using quick sort. Mention time complexity.

65	40	75	80	45

                                                                                           (08 Marks)

OR

4   a.   What are the disadvantage of divide and conquer approach?   **(04 Marks)**
    b.   Discuss decrease and conquer algorithmic technique. Explain its variations.   **(06 Marks)**
    c.   Write an algorithm for the below given problem in divide and conquer approach :
         i) Strasson's matrix
         ii) Finding maximum and minimum element in an array.   **(10 Marks)**

Module-3

5   a.   Differentiate between Prim's and Kruskal's algorithm.   **(04 Marks)**
    b.   Apply Greedy technique to solve the following instances of Knapsack problem n = 7, M – 15 profit (50, 10, 15, 7, 8, 9, 4), weight = (10, 3, 5, 4, 1, 3, 2).   **(08 Marks)**
    c.   Find minimum cost spanning tree for the following graph by using Kruskal algorithm. Mention time complexity.
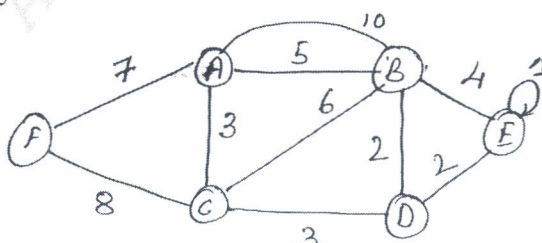

Fig.Q5(c)   **(08 Marks)**

OR

6 a. Find the shortest path for the given input using Dijikstra's algorithm. Consider source node as A.
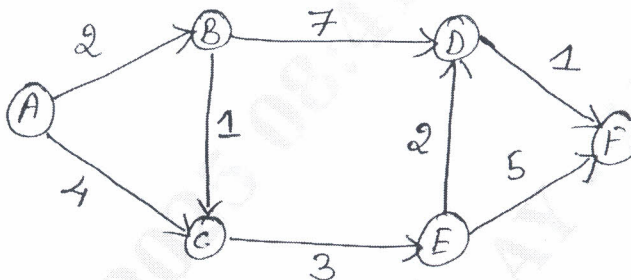

Fig.Q6(a) **(08 Marks)**

b. Define Heap. Write Bottom – up Heap construction algorithm. **(06 Marks)**

c. Write job sequencing with dead line algorithm. Also obtain an optimal schedule for the following jobs with n = 7, profits = {35, 30, 25, 20, 15, 12, 05} and deadline = {3, 4, 4, 2, 3, 1, 2} respectively. **(06 Marks)**

Module-4

7 a. Explain multistage graph with an example. Write backward multistage graph algorithm.
(10 Marks)

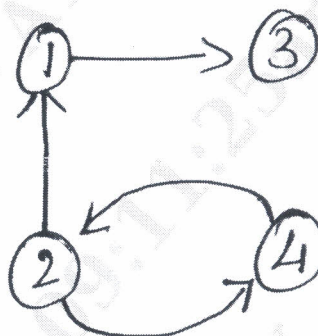b. Apply Warshall's algorithm to find the transitive closure of the following graph.

Fig.Q7(b) **(10 Marks)**

OR

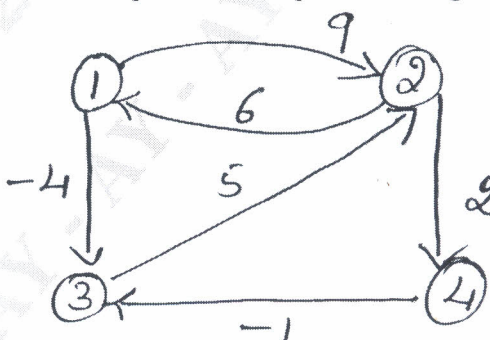8 a. Apply Floyd's algorithm to solve all pair shortest path for the given graph.

Fig.Q8(a) **(10 Marks)**

b. Construct optimal binary search tree for the following set of values :

Keys	1	2	3	4
Probability	4	2	6	3

(10 Marks)

Module-5

9   a.   Explain N – Queen problem with example.   (10 Marks)
    b.   Solve the following assignment problem using branch and bound technique :

$\rightarrow$ Job

		J1	J2	J3	J4
	a	9	2	7	8
$\downarrow$ Person	b	6	4	3	7
	c	5	8	1	8
	d	7	6	2	4

(10 Marks)

OR

10 a.   Explain Hamiltonian cycles with example.   (08 Marks)
    b.   Solve the travelling sales problem using branch and bound technique :

	1	2	3	4	5
1	∞	20	30	10	11
2	15	∞	16	4	2
3	3	5	∞	2	4
4	19	6	18	∞	3
5	16	4	7	16	∞

(12 Marks)

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