

**Model Question Paper-1 with effect from 2019-20 (CBCS Scheme)**

USN :

**Fourth Semester B.E. Degree Examination**

**Design and Analysis of Algorithms**

**Time: 03 Hrs**

**Max. Marks:100**

Note: Answer any **FIVE** full questions, choosing at least **ONE** question from each **MODULE**

<u>Module - 1</u>		
1	a.	Define algorithm. What are the criteria that an algorithm must satisfy? <span style="float: right;"><b>(08 Marks)</b></span>
	b.	Write an algorithm to find the maximum element in an array of n elements. Give the mathematical analysis of this non recursive algorithm. <span style="float: right;"><b>(08 Marks)</b></span>
	c.	Distinguish between the two common ways to represent a graph. <span style="float: right;"><b>(04 Marks)</b></span>
<b>OR</b>		
2	a.	Explain the general plan for analyzing the efficiency of a recursive algorithm. Write the algorithm to find a factorial of a given number. Derive its efficiency. <span style="float: right;"><b>(08 Marks)</b></span>
	b.	Discuss about the important problem types and fundamental data structures. <span style="float: right;"><b>(08 Marks)</b></span>
	c.	Explain with an example how a new variable count introduced in a program can be used to find the number of steps needed by a program to solve a problem instance. <span style="float: right;"><b>(04 Marks)</b></span>
<u>Module - 2</u>		
3	a.	Write the control abstraction for divide and conquer technique. <span style="float: right;"><b>(04 Marks)</b></span>
	b.	Design merge sort algorithm. Write a descriptive note on its its best case, average case, and worst-case time efficiency. <span style="float: right;"><b>(08 Marks)</b></span>
	c.	Discuss Strassen's matrix multiplication with a example. and derive its time complexity. <span style="float: right;"><b>(08 Marks)</b></span>
<b>OR</b>		
4	a.	Apply quick sort algorithm to sort the list E, X, A, M, P, L, E in alphabetical order. Draw the tree of recursive calls made. <span style="float: right;"><b>(08 Marks)</b></span>
	b.	Define topological sorting. Illustrate the topological sorting using DFS method for the following graph. <span style="float: right;"><b>(08 Marks)</b></span>
	c.	List out the advantages and disadvantages of divide and conquer approach. <span style="float: right;"><b>(04 Marks)</b></span>

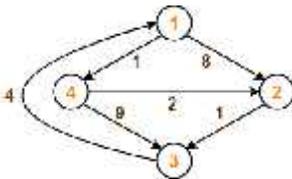
**Module - 3**

- 5 a. Solve the following instance of greedy knapsack problem where  $n=4$ ,  $m=10$ ,  $p = (40, 42, 25, 12)$  and  $w = (4, 7, 5, 3)$  **(06 Marks)**
- b. Write the problem statement for job sequencing with deadline? Let  $n=5$ , profits  $(10, 3, 33, 11, 40)$  and deadlines  $(3, 1, 1, 2, 2)$ . Find the optimal sequence of execution of job solution using greedy algorithm. **(06 Marks)**
- c. Define minimum cost spanning tree. Write Prim's algorithm to find minimum cost spanning tree. **(08 Marks)**

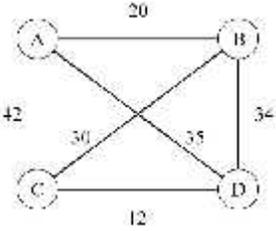
**OR**

- 6 a. Obtain the Huffman tree and the code for the following data **(04 Marks)**
- | Characters | Frequencies |
|------------|-------------|
| a          | 10          |
| e          | 15          |
| i          | 12          |
| o          | 3           |
| u          | 4           |
| s          | 13          |
| t          | 1           |
- b. Write an algorithm to find single source shortest path for a graph G whose edge weights are positive **(08 Marks)**
- c. Sort the given list of numbers using heap sort: 2, 9, 7, 6, 5, 8. **(08 Marks)**

**Module -4**

- 7 a. Define transitive closure. Write Warshall's algorithm to compute transitive closure. Mention its time efficiency **(08 Marks)**
- b. Apply Floyd's algorithm to find all pair shortest path for the graph given below. **(08Marks)**
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- c. Explain the concept of negative weight cycle in a directed graph **(04 Marks)**

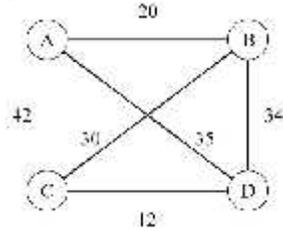
**OR**

- 8 a. Explain multistage graph with example. Write multistage graph algorithm to forward approach. **(08 Marks)**
- b. For the given graph, obtain optimal tour cost using dynamic programming. **(08 Marks)**
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- c. Explain the advantages of optimal binary search tree. **(04 Marks)**

**Module - 5**

9 a. Solve the given instance of sum of subset problem  $s=\{3,5,6,7\}$  and  $d=15$ . Construct a state space tree. **(08 Marks)**

b. With the help of a state space tree. Solve the Travelling Salesman Problem for the following graph using branch and bound concept. **(08Marks)**



c. Write the difference between backtracking and branch and bound. **(04 Marks)**

**OR**

10 a. Explain the class of NP- Hard and NP-Complete. **(08 Marks)**

b. Explain LC branch and bound concept for knapsack problem. **(04 Marks)**

c. Solve assignment problem for the following job assignment and obtain optimal solution. **(08 Marks)**

	Job 1	Job 2	Job 3	Job 4
A	9	2	7	8
B	6	4	3	7
C	5	8	1	8
D	7	6	9	4