

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

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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

Module - 1

- 1 a. Define algorithm. What are the criteria that an algorithm must satisfy? (08 Marks)
- b. Write an algorithm to find the maximum element in an array of n elements. Give the mathematical analysis of this non recursive algorithm. (08 Marks)
- c. Distinguish between the two common ways to represent a graph. (04 Marks)

OR

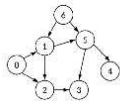
- 2 a. Explain the general plan for analyzing the efficiency of a recursive algorithm. Write the algorithm to find a factorial of a given number. Derive its efficiency. (08 Marks)
- b. Discuss about the important problem types and fundamental data structures. (08 Marks)
- c. Explain with an example how 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. (04 Marks)

Module - 2

- 3 a. Write the control abstraction for divide and conquer technique. (04 Marks)
- b. Design merge sort algorithm. Write a descriptive note on its best case, average case, and worst-case time efficiency. (08 Marks)
- c. Discuss Strassen's matrix multiplication with an example, and derive its time complexity. (08 Marks)

OR

- 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. (08 Marks)
- b. Define topological sorting. Illustrate the topological sorting using DFS method for the following graph. (08 Marks)



- c. List out the advantages and disadvantages of divide and conquer approach. (04 Marks)

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

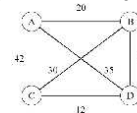
- 7 a. Define transitive closure. Write Warshall's algorithm to compute transitive closure. Mention its time efficiency (08 Marks)
- b. Apply Floyd's algorithm to find all pair shortest path for the graph given below. (08 Marks)



- c. Explain the concept of negative weight cycle in a directed graph (04 Marks)

OR

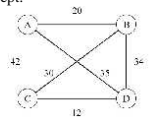
- 8 a. Explain multistage graph with example. Write multistage graph algorithm to forward approach. (08 Marks)
- b. For the given graph, obtain optimal tour cost using dynamic programming. (08 Marks)



- 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. (08 Marks)



- 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