Reg No.:_______________ 20MCA203122201 Name:__________________________

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Third Semester MCA (Two Years) Degree (R, S) Examination December/January 2023-24

Course Code: 20MCA203

Course Name: DESIGN & ANALYSIS OF ALGORITHMS

Max. Marks: 60 Duration: 3 Hours

PART A

Answer all questions, each carries3 marks. Marks

1	Define Big Oh and Ω notations. Give example.	(3)
2	Describe how divide and conquer technique increases efficiency of sorting algorithm.	(3)
3	Which data structure is used for efficient implementation of Kruskal's algorithm for finding minimal spanning tree? Explain operations supported by the data structure.	(3)
4	Write control abstraction for dynamic programming technique.	(3)
5	How does backtracking differ from branch and bound technique?	(3)
6	With decision tree, explain comparison-based sorting for three items a, b and c.	(3)
7	With the help of an example flow network, show that maximum flow value is the same as capacity of minimum cut in the network.	(3)
8	Explain different complexity classes.	(3)
9	Approximation algorithm generates an optimal solution. Comment on this statement.	(3)
10	Explain the concept of randomized quick sort. What is the advantage of using randomized quick sort over the conventional quick sort algorithm?	(3)

PART B

Answer any one question from each module. Each question carries 6 marks.

Module I

11 Solve the following recurrence relations. Given T(1) = 1 and c is a constant. (6)

a) $T(n) = T(n/2) + c, \quad n>1$

b) $T(n) = T(n-1) + n, \quad n>1$

OR

12 Write quick sort algorithm and illustrate using the data set: 45, 77, 23, 1, 90, 67, 19, 56. (6)

Module II

13 Explain solution of fractional knapsack problem using greedy strategy. Illustrate the algorithm using following input (capacity of the knapsack is 15). (6)

Objects:	1	2	3	4	5	6	7
Profit (P):	15	4	9	7	8	10	5
Weight(W):	5	2	3	4	1	3	1

OR

14 Explain all-pair shortest path algorithm with an example. (6)

Module III

15 Explain how N-Queens problem can be solved using backtracking technique. (6)

OR

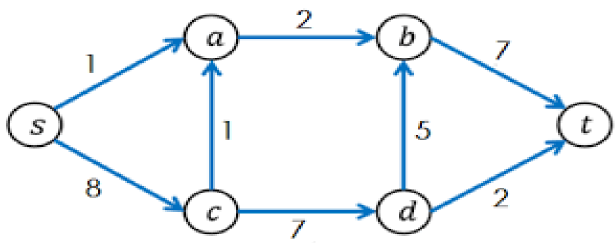
16 Discuss sum of subsets problem. Given a set S = {1, 2, 4, 8, 9, 10}. Construct state space tree and find all-possible subset combinations whose sum = 12. (6)

Module IV

17 What do you mean by polynomial time reduction? Explain its use in proving NP completeness. (6)

OR

18 Explain Ford-Fulkerson algorithm. Using the algorithm, find maximum flow in the given network (source vertex is *s* and sink vertex is *t*). (6)



Module V

19 Explain the approximation algorithm for vertex cover problem using linear programming. (6)

OR

20 Explain polynomial identity testing. Explain how randomization can be used to solve the problem. (6)

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