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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Third Semester MCA (Two Year) Degree (R,S) Examination December 2024

Course Code: 20MCA203

Course Name: DESIGN & ANALYSIS OF ALGORITHMS

Max. Marks: 60 Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks. Marks

1 Solve the following recurrence relation: (3)

$$T(n) = \begin{cases} 2T(n/2) + 1, n > 1 \\ 1, n \leq 1 \end{cases}$$

2 Quick sort algorithm has worst case time complexity of $O(n^2)$. Justify your answer. (3)

3 Define the term minimum spanning tree with an example. (3)

4 With the help of an example, show that no single source shortest path exists in a graph if it contains a negative weight cycle reachable form the source vertex. (3)

5 What do you understand by the term lower bound theory? Give an example lower bound. (3)

6 Define decision tree. Show the decision tree for binary search problem. (3)

7 Define polynomial time and exponential time algorithms with examples. (3)

8 Explain the properties of flow network. (3)

9 What do you mean by randomized algorithm? Mention its use. (3)

10 Define approximation ratio of an approximation algorithm. Also define polynomial time and fully polynomial time approximation schemes. (3)

PART B

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

Module I

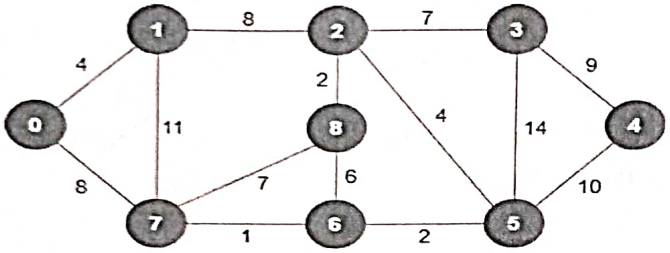
11 Explain the concept of merge sort algorithm and sort the following list using merge sort algorithm: 63, 24, 11, 72, 59, 45, 33, 26. (6)

OR

12 Explain Strassen's matrix multiplication algorithm. Derive its time complexity. (6)

Module II

13 Explain Prim's algorithm. Find the minimum spanning tree of following graph using Prim's algorithm. (6)



OR

14 Define travelling salesman problem. Explain the steps to solve the problem. (6)

Module III

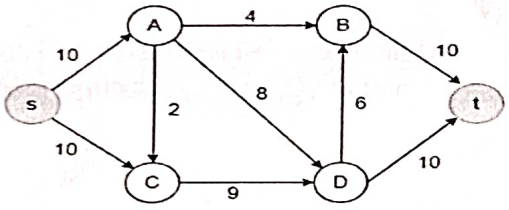
15 With an example, explain 8-puzzle problem. (6)

OR

16 Illustrate the solution of sum of subset problem using backtracking technique, with neat state space diagram. (6)

Module IV

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



OR

18 What do you mean by NP Complete problem? Show that clique problem is NP Complete. (6)

Module V

19 Explain the 2-approximation algorithm for vertex cover problem, with example. (6)

OR

20 State Schwartz-Zippel lemma and explain its use in polynomial identity testing. (6)

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