Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058, India
(Autonomous College Affiliated to University of Mumbai)

End Semester Examination

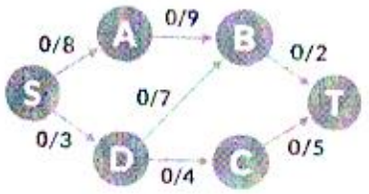
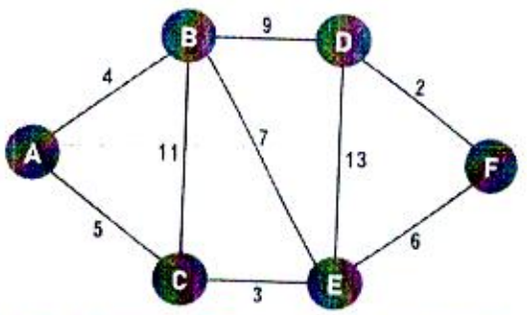
May 2024

Max. Marks: 100 Duration: 3.00 hrs
Class: F.Y.MCA Semester: II
Course Code:MC507 Branch: M.C.A.
Name of the Course: Design and Analysis of Algorithms

Instruction:
(1) All questions are compulsory
(2) Draw neat diagrams
(3) Assume suitable data if necessary

Q. No.	Questions	Max. Marks	CO-BL
Q1	What do you understand by Divide and Conquer approach? Compare Merge and Quick sort. Describe the best worst and average case for both the algorithm. a. If Merge sort is applied on the given input array: 85 24 63 45 17 31 96 50 what will be two halves for the last merge call? Solve it by drawing MergeSort tree. b. Solve the following using Quick sort considering the first element as pivot element. 54 26 93 17 77 31 44 55 20 What will be the two halves in the last sort?	20	CO2-4
Q2	What is the use of Algorithm in the world of Computing? Why should we use Master Method? Describe the equation form for master method? List and elaborate the cases for master method. State the limitations of Master method? a) Solve the following recurrence using Masters method $T(n)=T(2n/3)+1$ b) Consider the following recurrence relation using Substitution method(by changing variables):	20	CO1-4

	$T(n)=2T(\sqrt{n}) + \log n$		
Q3	Differentiate between Greedy and Dynamic Approach. Consider the following table for solving Knapsack problem with weight W=60 and 5 items **Item** / **Weight** / **Value** 1 / 5 / 30 2 / 10 / 40 3 / 15 / 45 4 / 22 / 77 5 / 25 / 90 a) A thief enters a house for robbing it. He can carry a maximal weight of 60 kg into his bag. There are 5 items in the house with the following weights and values. What items should thief take if he can even take the fraction of any item with him? What will be the total profit in this case? b) A thief enters a house for robbing it. He can carry a maximal weight of 60 kg into his bag. There are 5 items in the house with the following weights and values. What items should thief take if he cannot take the fraction of any item with him? What will be the total profit in this case? c) Justify the complexity for case a) and case b).	20	CO3-4
4	Solve the given Travelling Salesman problem using Branch and Bound Technique. Show step by step solving . Justify the complexity for the same. Draw the initial and final graph for the same. Write down the path to be taken and the minimum cost of the said path. $$\begin{array}{c} \\ 1 \\ 2 \\ 3 \\ 4 \\ 5 \end{array}\begin{array}{c} \begin{array}{ccccc} 1 & 2 & 3 & 4 & 5 \end{array} \\ \begin{bmatrix} \infty & 20 & 30 & 10 & 11 \\ 15 & \infty & 30 & 10 & 11 \\ 3 & 5 & \infty & 2 & 4 \\ 19 & 6 & 18 & \infty & 3 \\ 16 & 4 & 7 & 16 & \infty \end{bmatrix} \end{array}$$ OR Explain Ford Fulkerson algorithm in detail. Solve the network flow diagram given below using the same algorithm step by step. Show augmented path for every step. Derive complexity for the same. What is the maximum possible flow in the network.	20	CO4-4

			
Q5A	Explain Rabin Karp algorithm . Given two strings, one is a **text** string and the other is a **pattern** string. The task is to write the starting indexes of all the occurrences of the pattern string in the text string using Rabin Karp algorithm. Solve step by step. Justify the complexity for the same. Text String: c x y z g h x y z v j k x y z Pattern String: x y z	10	CO4-4
Q5B	Explain Dijkstra's algorithm along with complexity calculation. Solve the given network step by step with starting node as A. Show all the shortest path from vertex A. Show the cost of shortest path from vertex A to all the other nodes. 	10	CO3-4