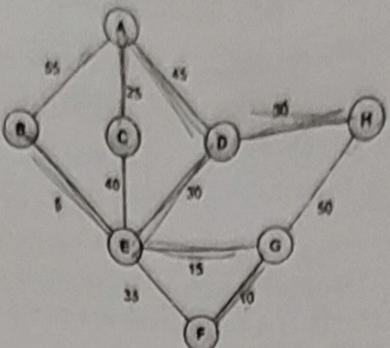


10.05.2024 (E)

Maximum Marks: 100	Semester: January 2024 – April 2024 Examination: ESE Examination	Duration: 3 Hrs.
Programme code: 01 Programme: B. Tech	Class: SY	Semester: IV (SVU 2020)
Name of the Constituent College: K. J. Somaiya College of Engineering	Name of the department: Computer Engineering	
Course Code: 116U01C402	Name of the Course: Analysis of Algorithms	
Instructions: 1) Draw neat diagrams 2) All questions are compulsory 3) Assume suitable data wherever necessary		

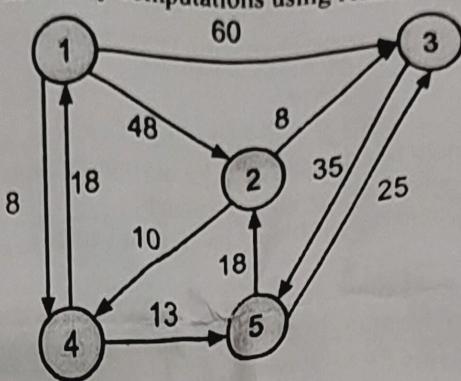
Que. No.	Question	Max. Marks
Q1	Solve any Four	20
i)	Solve following using back substitution method: $T(n) = 0$ $T(n) = n + T(n - 1), \quad n > 0$	5
ii)	Define asymptotic notation. Describe given asymptotic notations: O, Ω and Θ with the help of diagrams and examples of each.	5
iii)	Explain fractional Knapsack problem? Design and analyse greedy algorithm to solve it.	5
iv)	Given two sequences of characters. A = "CANADA" and B = "KANNADA". Obtain the Longest Common Subsequence using dynamic approach.	5
v)	Explain following terms for n-Queens problem: explicit constraints, implicit constraints, and bounding function.	5
vi)	Discuss the process and show the comparisons the naïve string matcher makes for the pattern P = 0001 in the text T = 0000 1000 1010001.	5

Que. No.	Question	Max. Marks
Q2 A	Solve the following:	10
i)	Solve the following recurrence relation $T(n) = 2T(\sqrt{n}) + \log n$ by making change of variables.	5
ii)	Solve following recurrence using recursion tree method: $T(n) = 3T\left(\frac{n}{3}\right) + n^3$	5
Q2 A	a. Explain worst case scenario and find worst case time complexity of quick sort with the help of recursion tree method. b. For the following list of elements trace the recursive algorithm for finding max and min and determine how many comparisons have been made. 22, 13, -5, -8, 15, 60, 17, 31, 47	10 (4+6)
Q 2 B	Solve any One	10
i)	What is the basic difference between Prim's and Kruskal's approach to obtain minimum spanning trees? Illustrate the results for following graph:	10 (5+5)



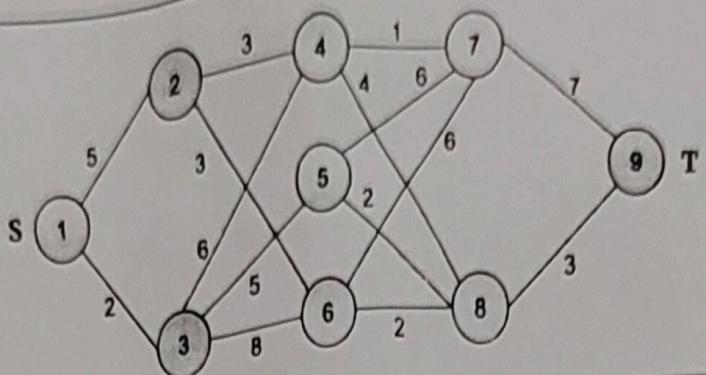
- ii) Find shortest distance and path from vertex 1 to all other vertices using Greedy approach. Show all necessary computations using relaxation formula.

10



Question

Que. No.	Question	Max. Marks
Q3	Solve any Two	20
i)	Use dynamic Programming Algorithm to find an optimal parenthesization of matrix chain multiplication of given sequence of dimension (11, 5, 8, 3, 9).	10
ii)	Consider the following weighted adjacency matrix. Draw the graph and apply dynamic programming to find the optimal travelling salesman tour. Assume that the starting vertex is 1. Also discuss time complexity of Travelling salesman problem for dynamic programming approach.	10 (7+3)
	$ \begin{array}{ c c c c c c} \hline & 1 & 2 & 3 & 4 \\ \hline 1 & 0 & 10 & 15 & 20 \\ \hline 2 & 5 & 0 & 9 & 10 \\ \hline 3 & 6 & 13 & 0 & 12 \\ \hline 4 & 8 & 8 & 9 & 0 \\ \hline \end{array} $	
iii)	Explain Multistage graph. Find the shortest path from the source to the sink in the given graph using backward approach of dynamic programming. Also write the recursive formulas for forwards and backward approach to solve given problem using dynamic programming.	10 (1+7+2)



Question

Que. No.	Question	Max. Marks
Q4	Solve any Two	20
i)	Construct planar graph for following map. Explain with the help of state space tree, minimum number of colors required to color the planar graph using m-coloring backtracking algorithm. Give all possible combinations of such color assignments using backtracking.	10 (1+7+2)
ii)	Explain Sum of Subset Problem. Apply backtracking to solve the following instance of the subset sum problem $S = \{2, 3, 4, 5\}$ and $d = 11$ with the help of state space tree. Will backtracking algorithm work correctly if we use just one of the two in-equalities to terminate a node as non-promising.	10 (8+2)
iii)	Solve the given 0/1 knapsack problem using Least Cost Branch and Bound with the help of state space tree. $n=4$, $(p_1, p_2, p_3, p_4) = (14, 10, 12, 21)$, $(w_1, w_2, w_3, w_4) = (2, 5, 6, 7)$, $m = 15$	10

Que. No.	Question	Max. Marks
Q5	(Write notes / Short question type) on any four	20
i)	Master's Theorem for decreasing functions.	5
ii)	Explain properties of Dynamic Programming with help of an example.	5
iii)	Compare Backtracking and Brute force approach.	5
iv)	Differentiate between KMP and String matching with finite Automata with the help of an example each.	5
v)	Differentiate between FIFOBB and LIFOBB with help of an example.	5
vi)	Discuss the relationship between classes P, NP, NP-complete and NP-hard with suitable example of each class.	5