Sardar Patel Institute of Technology

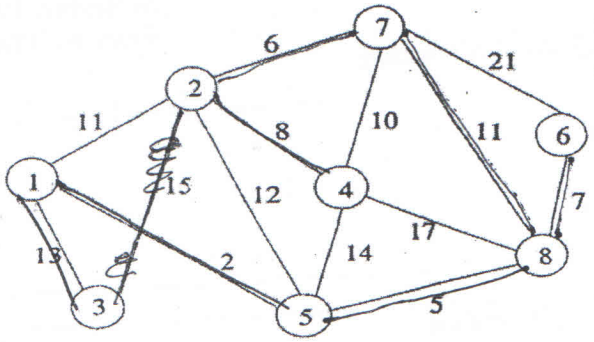
Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India
(Autonomous College Affiliated to University of Mumbai)

End Semester Examination
April 2018

Max. Marks: 100 **Duration: 3 Hrs**
Class: S.E. **Semester: IV**
Course Code: IT41 / CE41 **Branch: IT/COMP**
Name of the Course: Design And Analysis of Algorithms

Instructions:
(1) All Questions are Compulsory
(2) Draw neat diagrams
(3) Assume suitable data if necessary

Question No.	Question	Max. Mks	CO
Q. 1 a)	Write a short note on Growth function.	*05*	CO1
Q. 1 b)	Solve the given recurrence using Master Method Theorem: i) $T(n)= 3T(n/2) + n^2$ ii) $T(n)=T(n/2) + 2^n$	*05*	CO1
Q. 1 c)	Write an algorithm using Divide and conquer approach for finding minimum and maximum number form a given set. Analyze it's time complexity by stating its recurrence relation. Simulate the above algorithm to find Min and Max on the following elements. Show the tree of recursive calls 22 13 -5 -8 15 60 17 31 47	*10*	CO2
Q. 2 a)	Apply Dynamic programming approach to solve Traveling Sales Persons problem for the given instance of cost matrix 0 2 9 10 1 0 6 4 15 7 0 8 6 3 12 0	*10*	CO3
Q2. b)	Consider the following set of frequencies. A=2, B=6, C=4, D=15, E=7, F=22, G=9, H=17. Find the Huffman code for the same. **OR**	*10*	CO4

	Write Prim's algorithm and solve the given problem  2+5+7+11+6+8+13 = 52		
Q.3 a)	What are the steps of sequence we should follow to develop a dynamic programming approach. Show how these steps are applicable to solve Longest common subsequence problem efficiently using Dynamic programming approach	*10*	**CO3**
Q.3 b)	Consider the Traveling Salesperson instance defined by the cost matrix ∞ 11 10 9 8 ∞ 7 3 8 4 ∞ 4 11 10 5 ∞ ~~∞ 11 10 9~~ i) Obtain the reduced cost matrix ii) Draw the portion of state space tree that will be generated by LCBB. Label each node by its ĉ value. Write out the reduced matrices corresponding to each of these nodes. **OR** Compare Backtracking and Branch and Bound. Explain how 15-puzzle problem can be solved using Branch and Bound with the help of State Space Tree.	*10*	**CO5**
Q.4 a)	Write a backtracking algorithm for sum of subset problem. Draw portion of state space tree that is generated to find all possible subsets of w that sum to m using above algorithm for the given problem and : n=7, w= {5, 7, 10, 12, 15, 18, 20}, m=35	*10*	**CO5**
Q4 b)	Write short note on String Matching Algorithms. **OR**	*10*	**CO5**

	Write an algorithm of String matching with Finite Automata. Give one example of it.		
Q.5a)	Logo-motion is a sports apparel firm that manufactures jackets, hats, sweat outfits, and T-shirts for college and professional athletic teams. It has contracted with the State University Bookstore for two types of logo jackets, a deluxe jacket and a regular jacket. The deluxe jacket is heavier, with more pockets, a nicer lining, and an embroidered school name and logo. The regular jacket has sewn-on prefabricated logos and lettering. The major steps in the manufacture of these jackets are cutting the material, sewing, and decorating with embroidery or sewn-on items. The following table shows the resource requirements for each type of jacket and total weekly availability of resources.		CO6

School Jacket	Cutting (hr.)	Sewing (hr.)	Decoration (hr.)	Profit($)
Deluxe	0.16	0.47	0.40	18
Regular	0.15	0.28	0.14	12
Resource Availability	40.00	80.00	55.00	

i) Formulate a linear programming (LP) model to determine how many deluxe and regular jackets the company should produce in order to maximize profit. *05*

ii) Write the LP model derived in (i) into slack form. *02*

iii) Convert the given LP Primal Problem into Dual Problem *03*

Q.5. b) Solve the following linear program using SIMPLEX: *10* CO6

maximize $z=12x_1 + 16x_2$

subject to

$10x_1 + 20x_2 \leq 120$

$8x_1 + 8x_2 \leq 80$

x_1 and $x_2 \geq 0$

OR

Explain how to convert Linear Problem into the following form;

i) Standard and Slack form

ii) Dual Form.

Show above mentioned conversion (i and ii) with an example.