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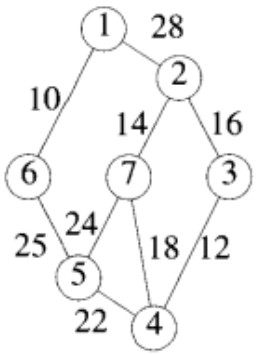
C19, URR-18 Write your Roll number ⇨ | | | | | | | | | | |

KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE, WARANGAL
(An Autonomous Institute under Kakatiya University, Warangal)
FACULTY OF ENGINEERING AND TECHNOLOGY
B.Tech. (IT) V Semester Examination, January 2021
U18IT503: Design and Analysis of Algorithms

Time: 3 *Hours*] [*Max. Marks :* 60

Note: Answer **all** the questions.

				CDLL	CO's
1.	a.	What is an Algorithm? What are the various criteria used to improve the characteristics of the algorithm?	[1]	R	CO1
	b.	What are space and time complexities?	[1]	R	CO1
	c.	What is the difference between a set and a disjoint set?	[1]	U	CO1
	d.	Write the control abstraction of the greedy approach.	[1]	R	CO2
	e.	What is meant by memoization?	[1]	R	CO2
	f.	What is the difference between optimal solution and feasible solution?	[1]	U	CO2
	g.	What is an optimal BST?	[1]	R	CO3
	h.	What is a TSP? How dynamic programming is useful for solving it?	[1]	U	CO3
	i.	Define sum of subsets problem.	[1]	U	CO3
	j.	What are heuristics? Do they always guarantee solutions?	[1]	R	CO4
	k.	Distinguish the branch-and-bound technique from the backtracking technique?	[1]	U	CO4
	l.	Define NP-hard and NP-easy.	[1]	U	CO4
2.	a.	Write the following algorithms: i. Union algorithm with weighting rule ii. Find algorithm with collapsing rule	[6]	R	CO1
	b.	Consider the behavior of WeightedUnion on the following sequence of unions starting from the initial configuration p[i] = -count[i] = -1, 1 ≤ i ≤ 8 = n: Union(1,2), Union(3,4), Union(5,6), Union(7,8), Union(1,3), union(5,7), Union(1,5)	[6]	U	CO1
		(OR)			
	c.	Write the Merge sort algorithm and Merge algorithm for sorting n elements.	[6]	R	CO1
	d.	Find an optimal solution to the knapsack instance n=7, m=15, (p1,…,p7) = (10,5,15,7,6,18,3) and (w1,…,w7) = (2,3,5,7,1,4,1).	[6]	U	CO1
3.	a.	Explain Strassen's matrix multiplication.	[6]	U	CO2
	b.	Consider the array of ten elements a[1:10] = (310, 285, 179, 652, 351, 423, 861, 254, 450, 520), sort these in ascending order using merge sort technique.	[6]	Ap	CO2
		(OR)			
	c.	Write the Prim's algorithm and explain the steps for finding MST for the below graph:	[6]	U	CO2



	d.	Find an optimal binary merge pattern for 10 files whose lengths are 28,32,12,5,84,53,91,35,3,11	[6]	Ap	CO2

P.T.O.

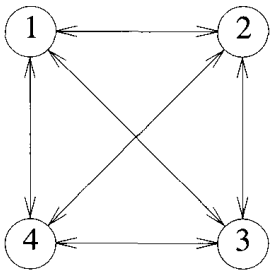
4. a. Use function OBST to compute w(*i,j*), r(*i,j*) and c(*i,j*), $0 \le i \le j \le 4$, for the identifier set (a1,a2,a3,a4)=(do,if,int,while) with p(1:4) = (3,3,1,1) and q(0:4) = (2,3,1,1,1). Using the r(*i,j*)'s, construct the optimal binary search tree. [6] Ap CO3

   b. Generate the sets S^i , $0 \le i \le 3$, when $(w_1,w_2,w_3) = (2,3,4)$ and $(p_1,p_2,p_3) = (1,2,5)$. [6] An CO3

(OR)

   c. Design a three stage system with device type D1, D2, D3. The costs are ₹30, ₹15 and ₹20 respectively. The costs of the system are to be more than ₹105. The reliability of each device to be 0.9, 0.8 and 0.5 respectively. [6] Ap CO3

   d. Consider the directed graph with the edge lengths given by the adjacency matrix. Find the optimal tour of the graph. [6] An CO3



$$\begin{bmatrix} 0 & 10 & 15 & 20 \\ 5 & 0 & 9 & 10 \\ 6 & 13 & 0 & 12 \\ 8 & 8 & 9 & 0 \end{bmatrix}$$

5. a. Solve the following instance of the TSP using LCBB. [6] Ap CO4

$$\begin{bmatrix} \infty & 20 & 30 & 10 & 11 \\ 15 & \infty & 16 & 4 & 2 \\ 3 & 5 & \infty & 2 & 4 \\ 19 & 6 & 18 & \infty & 3 \\ 16 & 4 & 7 & 16 & \infty \end{bmatrix}$$

   b. Draw the portion of the state space tree generated by LCBB for knapsack instance n = 4, m = 15, (p1,p2,p3,p4) = (10,10,12,18) and (w1,w2,w3,w4) = (2,4,6,9). [6] An CO4

(OR)

   c. Generate FIFO branch and bound solution for the given knapsack problem, m=15, n=4, (p1,p2,p3,p4)=(10,10,12,18) and (w1,w2,w3,w4) = (2,4,6,9). [6] Ap CO4

   d. Draw the portion of the state space tree generated by LCBB for knapsack instance n = 5, m = 15, (p1,p2,p3,p4,p5) = (w1,w2,w3,w4) = (4,4,5,8,9). [6] An CO4

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