Reg. No.												

Question Paper Code	12090

B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2023

Fourth Semester

Information Technology

(Common to Computer Science and Engineering, Artificial Intelligence and Data Science & M.Tech. - Computer Science and Engineering)

20ITPC401 - DESIGN AND ANALYSIS OF ALGORITHMS

(Regulations 2020)

Duration: 3 Hours | Max. Marks: 100

PART - A (10 × 2 = 20 Marks)

Answer ALL Questions

		Marks, K-Level, CO
1.	Compare the orders of growth of $n(n-1)/2$ and n^2.	*2,K2,CO1*
2.	What do you mean by Worst case Efficiency of an algorithm?	*2,K1,CO2*
3.	Design a brute-force algorithm for computing the value of a polynomial $p(x) = a_n x^n + a_{n-1}x^{n-1} + \cdots + a_1 x + a0$, where each a_i is a constant.	*2,K2,CO2*
4.	Define Hamiltonian Circuit. Give an example.	*2,K1,CO2*
5.	State the principle of Optimality.	*2,K1,CO3*
6.	List out the memory functions used under dynamic programming.	*2,K1,CO3*
7.	Comment on the capacity constraint in the context of maximum flow problem.	*2,K2,CO4*
8.	When a linear program is said to be unbounded?	*2,K2,CO4*
9.	Differentiate tractable from non-tractable problems.	*2,K2,CO5*
10.	Depict the proof which says that a problem 'A' is no harder or no easier than problem 'B'.	*2,K2,CO5*

PART - B (5 × 13 = 65 Marks)

Answer ALL Questions

11.	a)	With suitable illustrations, explain Big Omega, Big O and Big Theta Notations.	*13,K2,CO1*
		OR	
	b)	Give the general plan for analyzing the time efficiency of recursive algorithms. Use recurrence to find the number of moves for Towers of Hanoi problem. Discuss its time complexity.	*13,K2,CO1*
12.	a)	Determine the number of character comparisons made by the brute-force algorithm in searching for the pattern GANDHI in the text THERE_IS_MORE_TO_LIFE_THAN_INCREASING_ITS_SPEED	*13,K3,CO2*

Assume that the length of the text (47 characters long) is known before the search starts.

OR

b) Devise an algorithm for Quick Sort and derive its time complexity. For the above devised quick sort algorithm, derive the time complexity if all the elements are arranged in ascending order. *13,K3,CO2*

13. a) (i) What does dynamic programming have in common with divide-and-conquer? What is a principal difference between them? *3,K3,CO3*

(ii) Apply the bottom-up dynamic programming algorithm to the following instance of the knapsack problem: *10,K3,CO3*

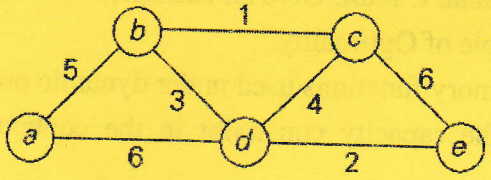
Item	Weight	Value
1	3	$25
2	2	$20
3	1	$15
4	4	$40
5	5	$50

Capacity W = 6.

OR

b) (i) Give a counter example that shows that Dijkstra's algorithm may not work for a weighted connected graph with negative weights. *3,K3,CO3*

(ii) Apply Kruskal's algorithm to find a minimum spanning tree of the following graph. *10,K3,CO3*



14. a) Solve the following linear programming problem. *13,K3,CO4*

maximize $x + 2y$

subject to $4x \geq y$

$y \leq 3 + x$

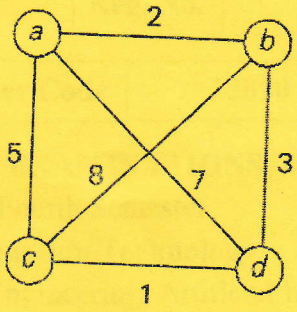
$x \geq 0, y \geq 0$

OR

b) Find a stable marriage matching for the instance defined by the following ranking matrix: *13,K3,CO4*

	A	B	C	D
α	1, 3	2, 3	3, 2	4, 3
β	1, 4	4, 1	3, 4	2, 2
γ	2, 2	1, 4	3, 3	4, 1
δ	4, 1	2, 2	3, 1	1, 4

15. a) Apply the branch-and-bound algorithm to solve the traveling salesman problem for the following graph. *13,K3,CO5*

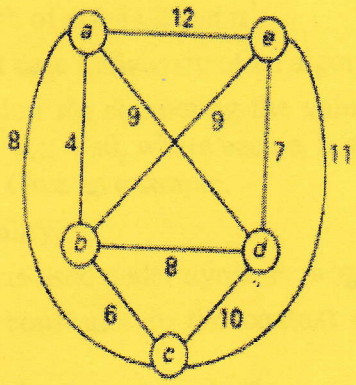


OR

b) Apply backtracking to solve the following instance of the subset sum problem: A = {1, 3, 4, 5} and d = 11. *13,K3,CO5*

PART - C (1 × 15 = 15 Marks)

16. a) Construct a minimum spanning tree of the given graph using travelling salesman algorithm. *15,K3,CO6*



OR

b) Explain the assignment problem using a branch and bound technique with example. *15,K3,CO6*