Subject Code: 20CS301PC	SET-II	HT NO:			7	R					

CMR TECHNICAL CAMPUS

UGC AUTONOMOUS

B. Tech. III Semester Regular/Supply End Examinations, Feb-2023

Design &Analysis Algorithms

Common to CSM, CSD, CSG, AIML

Time: 3 Hours **Max. Marks: 70**

Note

i. This Question paper contains Part- A and Part- B.
ii. All the Questions in Part A are to be answered compulsorily.
iii. All Questions from Part B are to be answered with internal choice among them.

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PART-A

10 X 02 = 20 Marks

			Marks	CO	BL
1.	a	Distinguish between Algorithm and Psuedocode.	2	CO1	L2
	b	Write Weighing Union algorithm?	2	CO1	L1
	c	Describe the Algorithm Analysis of Binary Search.	2	CO2	L2
	d	Distinguish between Prim's and Kruskal's Spanning tree algorithm	2	CO2	L4
	e	Draw all possible binary search trees for the identifier set (do, if, stop).	2	CO3	L3
	f	Give the statement of Reliability design problem.	2	CO3	L1
	g	Define graph coloring	2	CO4	L1
	h	Define : i) LC – Search ii) Branch and Bound (BB) iii) FIFO – BB.	2	CO4	L1
	i	What are tractable and non-tractable problems?	2	CO5	L1
	j	Define NP complete problem.	2	CO5	L1

PART- B

5 X 10 = 50 Marks

			Marks	CO	BL
2.	a	Give the algorithm for matrix additions and determine the time complexity of this algorithm by frequency–count method.	5	CO1	L2
	b	Explain the role of instance characteristics in finding the time and space complexities with an example	5	CO1	L2
		OR			
3	a	Write short notes on the performance analysis of an algorithm.	5	CO1	L2
	b	Explain Spanning tree with example.	5	CO1	L4

4	a	Show the result of running Quick sorting technique on the sequence 38,27,43,3,9,82,10	5	CO2	L6
	b	Differentiate between Prim's Algorithm and Kruskal's Algorithm	5	CO2	L4
		OR			
5	a	Sort the list of the elements 10,5,7,6,1,4,8,3,2,9 using merge sort algorithm and show its computing time is O(n log n).	5	CO2	L4
	b	Consider the following instance of knapsack problem n = 7, m = 15 (P1, P2, P3, P4, P5, P6, P7) = (10, 5, 15, 7, 6, 18, 3) and (W1, W2, W3, W4, W5, W6, W7) = (2, 3, 5, 7, 1, 4, 1) solve by using Greedy approach.	5	CO2	L3
6	a	Consider A1=5X4, A2=4X6, A3=6X2, A4=2X7.P1=5, P2=4, P3=6, P4=2, P5=7 and Apply matrix chain multiplication to obtain optimal sequence.	5	CO3	L3
	b	Find the all pairs shortest path solution for the graph represented by below adjacency matrix: $\begin{bmatrix} \infty & 6 & 5 & 4 \\ 3 & \infty & 2 & 6 \\ 18 & 6 & \infty & 7 \\ 8 & 12 & 10 & \infty \end{bmatrix}$	5	CO3	L3
		OR			
7	a	Solve the following instance of 0/1 Knapsack problem using Dynamic programming n = 3; (W1, W2, W3) = (3, 5, 7); (P1, P2, P3) = (3, 7, 12); M = 4	5	CO3	L4
	b	Write recurrence relations for solving OBST using dynamic programming and construct the tree for given data: n=4, (a1, a2, a3,a4) = (end, goto, print, stop) p(1:4)=(1/20, 1/5, 1/10, 1/20) q(0:4)=(1/5, 1/10, 1/5,1/20, 1/20) Where Ps are probability of successful search and qs are probability of unsuccessful search	5	CO3	L5
8	a	What is a backtracking? Give the explicit and implicit constraints in 8 queen's problem.	5	CO4	L6
	b	Draw the portion of the state space tree generated by LC branch and bound of knapsack problem for an instance n=4, (P1, P2, P3, P4) = (10, 10, 12, 18), (w1, w2, w3, w4)=(2, 4, 6, 9), and m=15.	5	CO4	L4
		OR			
9	a	Write the backtracking algorithm for the sum of subsets problem using the state space tree corresponding to m=35, w=(20,18,15,12,10,7,5).	5	CO4	L4
	b	Write the branch and bound algorithm to generate minimum length tour for the given cost adjacency matrix.	5	CO4	L6

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Design &Analysis Algorithms

Common to CSM, CSD, CSG, AIML

Time: 3 Hours **Max. Marks: 70**

Note

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ii. All the Questions in Part A are to be answered compulsorily.
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PART-A

10 X 02 = 20 Marks

			Marks	CO	BL
1.	a	Distinguish between Algorithm and Psuedocode.	2	CO1	L2
	b	Write Weighing Union algorithm?	2	CO1	L1
	c	Describe the Algorithm Analysis of Binary Search.	2	CO2	L2
	d	Distinguish between Prim's and Kruskal's Spanning tree algorithm	2	CO2	L4
	e	Draw all possible binary search trees for the identifier set (do, if, stop).	2	CO3	L3
	f	Give the statement of Reliability design problem.	2	CO3	L1
	g	Define graph coloring	2	CO4	L1
	h	Define : i) LC – Search ii) Branch and Bound (BB) iii) FIFO – BB.	2	CO4	L1
	i	What are tractable and non-tractable problems?	2	CO5	L1
	j	Define NP complete problem.	2	CO5	L1

PART- B

5 X 10 = 50 Marks

			Marks	CO	BL
2.	a	Give the algorithm for matrix additions and determine the time complexity of this algorithm by frequency–count method.	5	CO1	L2
	b	Explain the role of instance characteristics in finding the time and space complexities with an example	5	CO1	L2
		OR			
3	a	Write short notes on the performance analysis of an algorithm.	5	CO1	L2
	b	Explain Spanning tree with example.	5	CO1	L4

Subject Code: 20CS301PC	SET-II	HT NO:			7	R				

4	a	Show the result of running Quick sorting technique on the sequence 38,27,43,3,9,82,10	5	CO2	L6
	b	Differentiate between Prim's Algorithm and Kruskal's Algorithm	5	CO2	L4
		OR			
5	a	Sort the list of the elements 10,5,7,6,1,4,8,3,2,9 using merge sort algorithm and show its computing time is O(n log n).	5	CO2	L4
	b	Consider the following instance of knapsack problem n = 7, m = 15 (P1, P2, P3, P4, P5, P6, P7) = (10, 5, 15, 7, 6, 18, 3) and (W1, W2, W3, W4, W5, W6, W7) = (2, 3, 5, 7, 1, 4, 1) solve by using Greedy approach.	5	CO2	L3
6	a	Consider A1=5X4, A2=4X6, A3=6X2, A4=2X7.P1=5, P2=4, P3=6, P4=2, P5=7 and Apply matrix chain multiplication to obtain optimal sequence.	5	CO3	L3
	b	Find the all pairs shortest path solution for the graph represented by below adjacency matrix:	5	CO3	L3

$$\begin{bmatrix} \infty & 6 & 5 & 4 \\ 3 & \infty & 2 & 6 \\ 18 & 6 & \infty & 7 \\ 8 & 12 & 10 & \infty \end{bmatrix}$$

OR

7	a	Solve the following instance of 0/1 Knapsack problem using Dynamic programming n = 3; (W1, W2, W3) = (3, 5, 7); (P1, P2, P3) = (3, 7, 12); M = 4	5	CO3	L4
	b	Write recurrence relations for solving OBST using dynamic programming and construct the tree for given data: n=4, (a1, a2, a3,a4) = (end, goto, print, stop) p(1:4)=(1/20, 1/5, 1/10, 1/20) q(0:4)=(1/5, 1/10, 1/5,1/20, 1/20) Where Ps are probability of successful search and qs are probability of unsuccessful search	5	CO3	L5
8	a	What is a backtracking? Give the explicit and implicit constraints in 8 queen's problem.	5	CO4	L6
	b	Draw the portion of the state space tree generated by LC branch and bound of knapsack problem for an instance n=4, (P1, P2, P3, P4) = (10, 10, 12, 18), (w1, w2, w3, w4)=(2, 4, 6, 9), and m=15.	5	CO4	L4
		OR			
9	a	Write the backtracking algorithm for the sum of subsets problem using the state space tree corresponding to m=35, w=(20,18,15,12,10,7,5).	5	CO4	L4
	b	Write the branch and bound algorithm to generate minimum length tour for the given cost adjacency matrix.	5	CO4	L6

Subject Code: 20CS301PC	SET-II	HT NO:			7	R					

$$\begin{bmatrix} \infty & 18 & 28 & 8 & 9 \\ 13 & \infty & 14 & 2 & 1 \\ 1 & 3 & \infty & 1 & 2 \\ 17 & 4 & 16 & \infty & 1 \\ 14 & 2 & 5 & 16 & \infty \end{bmatrix}$$

10	a	What is Class NP? Discuss about any five problems for which no polynomial-time algorithm has been found.	5	CO5	L4
	b	Describe NP-hard and NP-completeness.	5	CO5	L3
		OR			
11	a	Distinguish between the P and NP problems.	5	CO5	L4
	b	State and explain cook's theorem?	5	CO5	L2

CO : Course Outcomes

BL : Bloom's Taxonomy Levels L 1 : Remembering L 2 : Understanding

L 3 : Applying L 4 : Analysing

L 5 : Evaluating L 6 : Creating

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CMR TECHNICAL CAMPUS
UGC AUTONOMOUS
B.Tech - III Semester, Supply Examinations, July-2022
Design &Analysis Algorithms[20CS301PC]
(Common to CSM & CSD)

Time: 3 Hours **Max. Marks: 70**

Answer Any Five Questions
All Questions Carry Equal Marks

5X 14 = 70 Marks

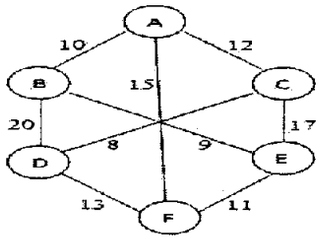
1.a. For T(n)=7T(n/2)+18n2 Solve the recurrence relation and find the time complexity. [7M]

b. Explain about Connected and Bi connected components. [7M]

2. a. What are the features of an efficient algorithm? Explain with an example. [7M]

b. Explain about And or graph with an example. [7M]

3. Find Minimum cost Spanning tree by using Prims and Kruskal's algorithm for the following graph analyse the both algorithms. [14M]



4. a. Apply quick sort algorithm to sort the list. 10, 5, 19, 25, 4, 6, 2 in ascending order. [7M]

b. Analyise the best, average and worst case complexity of quick sort. [7M]

5. Construct an optimal travelling sales person tour using Dynamic Programming. [14M]

$$\begin{pmatrix} 0 & 10 & 9 & 3 \\ 5 & 0 & 6 & 2 \\ 9 & 6 & 0 & 7 \\ 7 & 3 & 5 & 0 \end{pmatrix}$$

6. Write a function to compute lengths of shortest paths between all pairs of nodes for the given adjacency matrix. [14M]

$$\begin{pmatrix} 0 & 6 & 13 \\ 8 & 0 & 4 \\ 5 & \infty & 0 \end{pmatrix}$$

7. Give the statement of sum –of subsets problem. Find all sum of subsets for n=4, (w1, w2, w3, w4) = (11, 13, 24, 7) and M=31.Draw the portion of the state space using backtracking approach. [14M]

8. Explain NP complete and NP Hard Problems. [14M]

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CMR TECHNICAL CAMPUS

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B. Tech. III Semester Supply End Examinations, February-2024

Design &Analysis Algorithms

Common to CSM, CSD, CSG, AIML

Time: 3 Hours **Max. Marks: 70**

Note

i. This Question paper contains Part- A and Part- B.
ii. All the Questions in Part A are to be answered compulsorily.
iii. All Questions from Part B are to be answered with internal choice among them.

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PART-A

10 X 02 = 20 Marks

			Marks	CO	BL
1.	a	Present an algorithm that searches an unsorted array a[1 : n] for the element 'x'. If 'x' occurs, then returns a position in the array, else return zero?	2	CO1	3
	b	State the weighting, collapsing rules in sets.	2	CO1	1
	c	Explain about single source shortest path problem.	2	CO2	2
	d	Write the recurrence relation for divide and conquer and explain.	2	CO2	4
	e	Discuss feasible solution, optimal solution and objective functions with example.	2	CO3	1
	f	State the principle of optimality. Find two problems for which the principle does not hold.	2	CO3	3
	g	What are the factors that influence the efficiency of the backtracking algorithm?	2	CO4	2
	h	What is meant by all pairs shortest path problem?	2	CO4	1
	i	Give some examples of P and NP problem.	2	CO5	3
	j	Compare class P and class NP.	2	CO5	4

PART- B

5 X 10 = 50 Marks

			Marks	CO	BL
2.	a	What are sets? How are they represented?	5	CO1	2
	b	Write short notes on performance analysis of an algorithm.	5	CO1	2
		OR			
3	a	Implement an algorithm to generate Fibonacci number sequence and determine the time complexity of the algorithm using the frequency method	5	CO1	5
	b	Explain in detail about AND/OR graphs	5	CO1	2
4	a	Define spanning tree. Compute a minimum cost spanning tree for the graph of figure using prim's algorithm.	5	CO2	3

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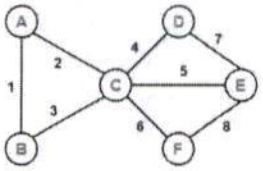

	b	Explain the working of Strassen's Matrix Multiplication with the help of divide and conquer method	5	CO2	2
		OR			
5	a	Consider the following 5 jobs with their associated deadline and profit. Index 1 2 3 4 5 job j2 j1 j4 j3 j5 deadline 1 2 2 3 1 profit 100 60 40 20 20 Solve the problem to earn maximum profit when only one job can be scheduled or processed at any given time.	5	CO2	6
	b	Discuss the time complexity of Binary search algorithm for best and worst case.	5	CO2	5
6	a	Construct a system with multiple devices connected parallel in three stages. The costs of the devices are 25, 10 and 15 respectively. The cost of the system is to be no more than 100. The reliability of each device type is 0.8, 0.7 and 0.4 respectively.	5	CO3	4
	b	Describe All-pairs shortest path algorithm with example. Give the time complexity of the algorithm.	5	CO3	5
		OR			
7	a	Describe the Travelling sales person problem and discuss how to solve it using dynamic programming.	5	CO3	4
	b	Let the dimensions of A,B,C,D respectively be 10X5, 5X15, 15X8, 8X20 generate matrix product chains that produces minimum number of matrix multiplications using dynamic programming.	5	CO3	3
8	a	Explain the FIFO BB 0/1 Knapsack problem procedure with the knapsack instance for n=4, m=15, (p1,p2,p3,p4)=(10,10,12,18), (w1,w2,w3,w4) =(2, 4, 6, 9). Draw the portion of the state space tree and find optimal solution	5	CO4	4
	b	Explain the Graph–coloring problem. And draw the state space tree for m= 3 colors n=4 vertices graph. Discuss the time and space complexity.	5	CO4	4
		OR			
9	a	Draw the portion of state space tree generated by recursive backtracking algorithm for sum of subsets problem with an example.	5	CO4	4
	b	Solve the Travelling Salesman problem using branch and bound algorithms.	5	CO4	6
10	a	Explain what are NP-Hard and NP-Complete problems	5	CO5	5
	b	Write the non-deterministic sorting algorithm and also analyze its complexity?	5	CO5	6
		OR			

Subject Code: 20CS301PC	SET-I	HT NO:			7	R					

11	a	State Cook's theorem. Explain its significance in NP-complete theory.	5	CO5	4
	b	Discuss NP-Hard code generation problems	5	CO5	4

CO : Course Outcomes

BL : Bloom's Taxonomy Levels **L 1 : Remembering** **L 2 : Understanding**

L 3 : Applying **L 4 : Analysing**

L 5 : Evaluating **L 6 : Creating**

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