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Roll Number:

Thapar Institute of Engineering and Technology, Patiala

Department of Computer Science and Engineering

Master of Computer Applications (II Semester) EST **MCA205: Design and Analysis of Algorithms**

June, 2022

Time: 2 hours; MM: 25 Name of Faculty: Dr. Gaurav Pareek

Note: Attempt all Questions. Be precise in answering the questions. Unnecessary details attract penalties.

Q1.	a)	Out of the LIFO, FIFO and Least Cost Branch and Bound techniques, which one is the most suitable for solving minimization problems and why? **(2)**
	b)	Suppose you have the coins of following denominations: 2, 3, 5, 10. Using the dynamic programming approach, calculate the total number of ways in which a sum of 15 can be constructed using these coins. **(3)**
Q2.	a)	Write the basic equation involved in the dynamic programming solution for the 0/1 knapsack problem. **(1)**
	b)	Consider the following instance of 0/1 knapsack: **(4)** Value[] = {3, 4, 5, 6} Weight[] = {2, 3, 4, 5} Knapsack capacity W = 5. Use dynamic programming algorithm to maximize the total profit for the above instance.
Q3.	a)	Suppose you are required to solve the all-pair shortest path problem using the single-source shortest path algorithm like Dijkstra's algorithm. How would you do it? What will be the time complexity of your solution? **(2)**
	b)	Solve the following instance of the 0/1 knapsack problem using least-cost branch and bound strategy: **(3)** Value[] = {10, 10, 12, 8} Weight[] = {2, 4, 6, 9} Knapsack capacity W = 15
Q4.	a)	Apply the Backtracking strategy and solve the following instance of the subset sum problem: **(5)** Weights[] = {5, 10, 12, 13, 15, 18} Total Sum to be constructed = 30
Q5.	a)	State the Optimal Binary Search Tree Problem. Also, give an example where the average time to access each item in a balanced binary search tree is more than in the case of unbalanced binary search tree. **(2)**
	b)	Use the backtracking approach to solve the 5-Queens problem. Draw a clear state-space tree and write your solution in the form of a 5-tuple where the i^{th} entry indicates the column position of the i^{th} queen on the 5×5 chessboard. **(3)**