

Course Code: BSCS2315 Course Name: DAA

Syllabus

UNIT I INTRODUCTION: Introduction to Algorithms – Fundamentals of Algorithmic Problem

Solving – Fundamentals of the Analysis of Algorithmic Efficiency – Analysis Framework –

Asymptotic Notations and Basic Efficiency Classes – Mathematical Analysis of Recursive

Algorithms – Mathematical Analysis of Non-recursive Algorithms

UNIT II DIVIDE-AND-CONQUER: Divide and Conquer Methodology – Binary Search – Merge Sort

– Quick Sort – Heap Sort – Multiplication of Large Integers – Strassen's Matrix Multiplication

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UNIT III DYNAMIC PROGRAMMING: Dynamic Programming – Change-making Problem –

Computing a Binomial Coefficient – All-pairs Shortest-paths Problem – Warshall's and Floyd's

Algorithms – 0/1 Knapsack Problem

UNIT IV GREEDY TECHNIQUE: Greedy Technique – Minimum Spanning Tree – Prim's Algorithm –

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Kruskal's Algorithm – Single-source Shortest-paths Problem – Dijkstra's Algorithm – Huffman

Coding – Fractional Knapsack Problem



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UNIT V BACKTRACKING AND BRANCH-AND-BOUND: Backtracking - N-Queens Problem -

Hamiltonian Circuit Problem – Subset Sum Problem – Branch-and- Bound – Travelling Salesman

Problem

UNIT VI LIMITATIONS OF ALGORITHM POWER: P and NP Problems – NP-Complete Problems –

Decision Trees - Information Retrieval - Pattern Matching - Data Science Algorithms



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Dynamic Programming - Change-making Problem -

Computing a Binomial Coefficient – All-pairs Shortest-

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0/1 Knapsack Problem



than just currency.

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Change Making Problem

Ц	The change-making problem addresses the question of finding the minimum
	number of coins (of certain denominations) that add up to a given amount of
	money.
	This are an airlease of the interesting and have an Albara and in the second and
Ч	It is a special case of the integer knapsack problem, and has applications wider

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Change Making Problem

It is also the most common variation of the coin change problem, a general case of partition in which, given the available denominations of an infinite set of coins, the objective is to find out the number of possible ways of making a change for a specific amount of money, without considering the order of the coins.
making change is minimization problem, we choose the solution where we have to give minimum no of coins for given amount.

☐ Methods of solving: 1. Greedy Method 2. Dynamic Method

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Change-Making Problem

Given unlimited amounts of coins of denominations

$$d_1 > \ldots > d_m$$

give change for amount n with the least number of coins

Example: $d_1 = 25c$, $d_2 = 10c$, $d_3 = 5c$, $d_4 = 1c$ and n = 48c

solution: <1, 2, 0, 3>



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$$F[0] = 0$$

$$F[1] = \min\{F[1-1]\} + 1 = 1$$

$$F[2] = \min\{F[2-1]\} + 1 = 2$$

$$F[3] = \min\{F[3-1], F[3-3]\} + 1 = 1$$

$$F[4] = \min\{F[4-1], F[4-3], F[4-4]\} + 1 = 1$$

$$F[5] = \min\{F[5-1], F[5-3], F[5-4]\} + 1 = 2$$

$$F[6] = \min\{F[6-1], F[6-3], F[6-4]\} + 1 = 2$$

FIGURE 8.2 Application of Algorithm *MinCoinChange* to amount n = 6 and coin denominations 1, 3, and 4.



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ALGORITHM ChangeMaking(D[1..m], n)

//Applies dynamic programming to find the minimum number of coins
//of denominations d_1 < d_2 < \cdots < d_m where d_1 = 1 that add up to a
//given amount n

//Input: Positive integer n and array D[1..m] of increasing positive

// integers indicating the coin denominations where D[1] = 1

//Output: The minimum number of coins that add up to n

F[0] \leftarrow 0
```

```
for i \leftarrow 1 to n do

temp \leftarrow \infty; \ j \leftarrow 1

while j \leq m and i \geq D[j] do

temp \leftarrow \min(F[i - D[j]], temp)

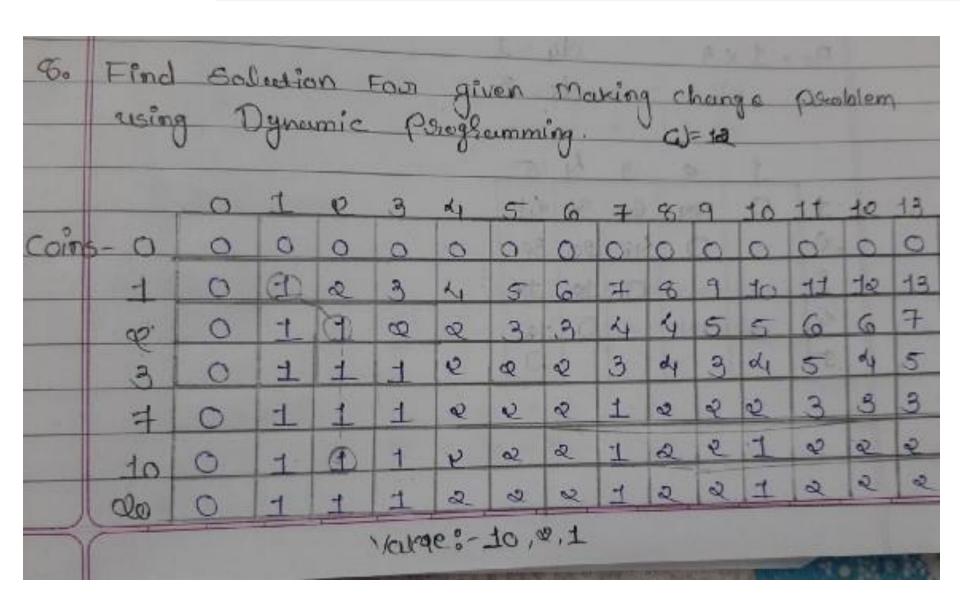
j \leftarrow j + 1

F[i] \leftarrow temp + 1

return F[n]
```



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Thank You