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Branch: - M.tech-CSE**(Data Science)**

Subject: - Complexity Theory & Algorithms

Practical-4

Aim: Solve Make-Change problem using Greedy approach.

Code for Make-Change Problem –

```
#include <bits/stdc++.h>
using namespace std;

void MakingChangeProblem(vector<int> &coins, int change, int n)
{
    vector<int> coinCount(n, 0);

    for (int i = 0; i < n; i++)
    {
        if (coins[i] > change)
        {
            continue;
        }
        else
        {
            change -= coins[i];
            coinCount[i]++;
            i--;
        }
    }
    int TotalCoins = accumulate(coinCount.begin(), coinCount.end(), 0);

    if (change > 0)
    {
        cout << "IMPOSSIBLE";
    }
    else
    {
        cout << "Optimal Coins used are: " << TotalCoins;
        cout << endl;
        for (int i = 0; i < n; i++)
        {
            if (coinCount[i] > 0)
            {
                cout << "{" << coins[i] << "}"
                     << " x " << coinCount[i] << " time"
                     << ", ";
            }
```

```
        }
    }
}

int main()
{
    int n;
    cout << "Enter the size of Demons: ";
    cin >> n;
    // vector<int> coins = {10, 20, 50, 100};
    vector<int> coins(n);
    for (int i = 0; i < n; i++)
    {
        cin >> coins[i];
    }
    sort(coins.begin(), coins.end());
    reverse(coins.begin(), coins.end());
    int change;
    cout << "-----------------------------------------------" << endl;
    cout << "Enter the Change: ";
    cin >> change;
    MakingChangeProblem(coins, change, n);
    return 0;
}
```

Output –

Test Case - 1

```
PS H:\Nirma\CTA\Pratical-4> g++ -o prob MakingChange.cpp
PS H:\Nirma\CTA\Pratical-4> ./prob
Enter the size of Demons: 4
10
20
50
100
-----------------------------------------------
Enter the Change: 50
Optimal Coins used are: 1
{50} x 1 time,
PS H:\Nirma\CTA\Pratical-4>
```

Test Case – 2

```
PS H:\Nirma\CTA\Pratical-4> g++ -o prob MakingChange.cpp
PS H:\Nirma\CTA\Pratical-4> ./prob
Enter the size of Demons: 4
10
20
50
100
-----------------------------------------------
Enter the Change: 70
Optimal Coins used are: 2
{50} x 1 time, {20} x 1 time,
PS H:\Nirma\CTA\Pratical-4>
```

Test Case – 3

```
PS H:\Nirma\CTA\Pratical-4> g++ -o prob MakingChange.cpp
PS H:\Nirma\CTA\Pratical-4> ./prob
Enter the size of Demons: 3
1
2
5
-----------------------------------------------
Enter the Change: 11
Optimal Coins used are: 3
{5} x 2 time, {1} x 1 time,
PS H:\Nirma\CTA\Pratical-4>
```

Test Case – 4

```
PS H:\Nirma\CTA\Pratical-4> g++ -o prob MakingChange.cpp
PS H:\Nirma\CTA\Pratical-4> ./prob
Enter the size of Demons: 3
12
2
5
-----------------------------------------------
Enter the Change: 0
Optimal Coins used are: 0
PS H:\Nirma\CTA\Pratical-4>
```

Test Case – 5

```
PS H:\Nirma\CTA\Pratical-4> g++ -o prob MakingChange.cpp
PS H:\Nirma\CTA\Pratical-4> ./prob
Enter the size of Demons: 6
2
4
6
8
10
12
-----------------------------------------------
Enter the Change: 53
IMPOSSIBLE
PS H:\Nirma\CTA\Pratical-4>
```