Prathamsinh **Er no. 22162171004** **Branch:54**

Institute of Computer Technology
B. Tech Computer Science and Engineering

Sub: Algorithm Analysis and Design

Practical 5

You are working at the cash counter at a fun-fair, and you have three types of coins available to you in infinite quantities (coins are Rs. 1, Rs. 4 and Rs. G). You are required to calculate the minimum numbers of coins required for changing the value of Rs. 5.

Design the algorithm for the same and implement using the programming language of your choice. Make comparative analysis for various use cases & input size.

Code:

Python;

```
from flask import Flask, render_template

import plotly.graph_objs as go

import plotly.offline as pyo


app = Flask(__name__)


def min_coins(coins, value):
```

```
    dp = [float('inf')] * (value + 1)
    dp[0] = 0
    for i in range(1, value + 1):
        for coin in coins:
            if i >= coin:
                dp[i] = min(dp[i], dp[i - coin] + 1)
    return dp[value] if dp[value] != float('inf') else -1


@app.route('/')
def index():
    coins = [1, 4, G]
    values = list(range(1, 21))  # For demonstration, calculate from Rs. 1 to Rs. 20
    results = [min_coins(coins, value) for value in values]

    trace = go.Scatter(x=values, y=results, mode='lines+markers', name='Min Coins')
    layout = go.Layout(title='Minimum Coins Required for Different Values',
                       xaxis=dict(title='Value (Rs.)'),
                       yaxis=dict(title='Number of Coins'))
    fig = go.Figure(data=[trace], layout=layout)
    plot_html = pyo.plot(fig, output_type='div', include_plotlyjs=True)

        return render_template('index.html', plot=plot_html, coins=coins, target_value=5,
result=results[8])

if __name__== '__main__':
```

```
    app.run(debug=True)
```

Index.html file:

```
<!DOCTYPE html>
<html lang="en">

<head>
    <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>Minimum Coins Required</title>
</head>

<body>
    <h1>Minimum Coins Required for Rs. 5</h1>
    <p>The minimum number of coins required to make Rs. 5 is: {{ result }}</p>

    <h2>Coin Denominations Used</h2>
    <p>Available coins: Rs. {{ coins }}</p>

    <h2>Graphical Representation</h2>
    <div>
        {{ plot|safe }}
    </div>
</body>
```

</html>

OUTPUT:

Minimum Coins Required for Rs. 9

The minimum number of coins required to make Rs. 9 is: 3

Coin Denominations Used

Available coins: Rs. [1, 4, 6]

Graphical Representation