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PRACTICAL – 5

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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. 6). You are required to calculate the minimum numbers of coins required for changing the value of Rs. 9.

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 code:-

```
# from flask import Flask, render_template, request

# app = Flask(__name__)

# # Function to calculate minimum coins
# def min_coins(value):
#     coins = [1, 4, 6]
#     dp = [float('inf')] * (value + 1)
#     dp[0] = 0 # Base case
```

```
#         for coin in coins:
#             for i in range(coin, value + 1):
#                 dp[i] = min(dp[i], dp[i - coin] + 1)

#         return dp[value] if dp[value] != float('inf') else -1 # Return
-1 if it's not possible

# @app.route('/', methods=['GET', 'POST'])
# def index():
#     min_coins_result = None
#     if request.method == 'POST':
#         value = int(request.form['value'])
#         min_coins_result = min_coins(value)

#     return render_template('index.html', result=min_coins_result)

# if __name__ == '__main__':
#     app.run(debug=True)
from flask import Flask, render_template, request

app = Flask(__name__)

# Function to calculate minimum coins and track used coins
def min_coins(value):
    coins = [1, 4, 6]
    dp = [float('inf')] * (value + 1)
    dp[0] = 0 # Base case
    coin_used = [-1] * (value + 1) # To track which coin was used

    for coin in coins:
```

```
        for i in range(coin, value + 1):
            if dp[i - coin] + 1 < dp[i]:
                dp[i] = dp[i - coin] + 1
                coin_used[i] = coin

    if dp[value] == float('inf'):
        return -1, [] # Return -1 if it's not possible, with an empty
list

    # Backtrack to find the coins used
    result_coins = []
    while value > 0:
        coin = coin_used[value]
        result_coins.append(coin)
        value -= coin

    return dp[value], result_coins

@app.route('/', methods=['GET', 'POST'])
def index():
    min_coins_result = None
    coins_used = []
    if request.method == 'POST':
        value = int(request.form['value'])
        min_coins_result, coins_used = min_coins(value)

    return render_template('index.html', result=min_coins_result,
coins_used=coins_used)

if __name__ == '__main__':
    app.run(debug=True)
```

HTML code:-

```
<!DOCTYPE html>
<html lang="en">
<head>
  <meta charset="UTF-8">
  <meta name="viewport" content="width=device-width, initial-
scale=1.0">
  <title>Minimum Coins Calculator</title>
  <link rel="stylesheet" href="{{ url_for('static',
filename='style.css') }}">
</head>
<body>
  <div class="container fade-in">
    <h1>Minimum Coins Calculator</h1>
    <form method="POST">
      <label for="value">Enter Value:</label>
      <input type="number" id="value" name="value" required>
      <button type="submit">Calculate</button>
    </form>
    {% if result is not none %}
      <h2>Minimum coins required: {{ result }}</h2>
      <h3>Coins Used: {{ coins_used }}</h3>
    {% endif %}
  </div>
</body>
</html>
```

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CSS code:-

```
body {
    font-family: Arial, sans-serif;
    background-color: #e0f7fa; /* Light blue background */
    margin: 0;
    padding: 20px;
}

.container {
    max-width: 400px;
    margin: auto;
    background: white;
    padding: 20px;
    border-radius: 8px;
    box-shadow: 0 0 20px rgba(0,0,0,0.2);
    transition: transform 0.3s ease-in-out; /* Animation for container */
}

h1, h2, h3 {
    text-align: center;
    color: #00796b; /* Dark teal color */
}

form {
    display: flex;
    flex-direction: column;
```

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```
}

label {
    margin-bottom: 10px;
}

input[type="number"] {
    padding: 10px;
    margin-bottom: 20px;
    border: 1px solid #ccc;
    border-radius: 4px;
}

button {
    padding: 10px;
    background-color: #00796b; /* Dark teal */
    color: white;
    border: none;
    border-radius: 4px;
    cursor: pointer;
    transition: background-color 0.3s; /* Animation for button */
}

button:hover {
    background-color: #004d40; /* Darker teal */
}

.fade-in {
    animation: fadeIn 0.5s ease-in;
}
```

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```
@keyframes fadeIn {  
  from { opacity: 0; }  
  to { opacity: 1; }  
}
```

OUTPUT:-

In output give input 9 so ans is [4,4,1] so calculation of coin

