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PRACTICAL - 7

Institute of Computer Technology
B. Tech Computer Science and Engineering

Sub: Algorithm Analysis and Design

Practical 7

A thief carrying a single knapsack with limited (W = 5) capacity. The museum you stole had
(n=4) artefacts that you could steal. Unfortunately, you might not be able to steal the entire
artefact because of your limited knapsack capacity.
Help the thief to cherry pick the artefact in order to maximise the total value (<=W) of the
artefacts you stole.
First solve the given below example:
Let n = 4, W=5
(P1, P2, P3, P4) = (3,4,5,6)
(w1, w2, w3, w4) = (2,3,4,5)

Code:-

```
from flask import Flask, render_template, request

app = Flask(__name__)

# Function to implement the Fractional Knapsack algorithm
def fractional_knapsack(values, weights, W):
    n = len(values)
    index = list(range(n))
    # Calculate value/weight ratio and sort items based on it
    ratio = [v / w for v, w in zip(values, weights)]
```

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```
    index.sort(key=lambda i: ratio[i], reverse=True)

    max_value = 0
    fractions = [0] * n

    for i in index:
        if weights[i] <= W:
            max_value += values[i]
            W -= weights[i]
            fractions[i] = 1
        else:
            fractions[i] = W / weights[i]
            max_value += values[i] * fractions[i]
            break

    return max_value, fractions

@app.route('/')
def index():
    return render_template('index.html')

@app.route('/calculate', methods=['POST'])
def calculate():
    # Get user input from form
    values = list(map(int, request.form['values'].split(',')))
    weights = list(map(int, request.form['weights'].split(',')))
    W = int(request.form['capacity'])

    # Call the knapsack function
    max_value, fractions = fractional_knapsack(values, weights,
W)
```

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```
    return render_template('index.html', max_value=max_value,
fractions=fractions, values=values, weights=weights)

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

Index.html

```
<!DOCTYPE html>
<html>
<head>
    <title>Fractional Knapsack Problem</title>
    <style>
        body {
            font-family: Arial, sans-serif;
            background-color: #f4f4f4;
            color: #333;
            text-align: center;
            padding: 20px;
        }
        h1 {
            color: #005f73;
        }
        form {
            margin-bottom: 20px;
        }
        input[type="text"], input[type="number"] {
            padding: 10px;
            width: 60%;
            margin-bottom: 10px;
            border: 1px solid #ccc;
```

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```
            border-radius: 5px;
        }
        input[type="submit"] {
            padding: 10px 20px;
            background-color: #005f73;
            color: #fff;
            border: none;
            border-radius: 5px;
            cursor: pointer;
        }
        input[type="submit"]:hover {
            background-color: #0a9396;
        }
        table {
            width: 50%;
            margin: 20px auto;
            border-collapse: collapse;
        }
        table, th, td {
            border: 1px solid #005f73;
        }
        th, td {
            padding: 10px;
            text-align: center;
        }
        th {
            background-color: #94d2bd;
        }
        td {
            background-color: #e9f5f2;
        }
    </style>
```

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```
</head>
<body>
    <h1>Fractional Knapsack Problem</h1>
    <form action="/calculate" method="post">
        <input type="text" name="values" placeholder="Enter
values (comma-separated)" required><br>
        <input type="text" name="weights" placeholder="Enter
weights (comma-separated)" required><br>
        <input type="number" name="capacity" placeholder="Enter
knapsack capacity" required><br>
        <input type="submit" value="Calculate">
    </form>

    {% if max_value is not none %}
    <h2>Results</h2>
    <p><strong>Maximum Value:</strong> {{ max_value }}</p>
    <table>
        <tr>
            <th>Artifact</th>
            <th>Value</th>
            <th>Weight</th>
            <th>Fraction Taken</th>
        </tr>
        {% for i in range(values|length) %}
        <tr>
            <td>{{ i + 1 }}</td>
            <td>{{ values[i] }}</td>
            <td>{{ weights[i] }}</td>
            <td>{{ fractions[i] }}</td>
        </tr>
        {% endfor %}
    </table>
```

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```
    {% endif %}
</body>
</html>
```

Output:-