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Institute of Computer Technology
B. Tech Computer Science and Engineering

Sub: Algorithm Analysis and Design

Practical 9

- A thief is robbing a store and can carry a maximal weight of W into his knapsack. There are n items available in the store and weight of i^{th} item is wi and its profit is pi. What items should the thief take?
- In this context, the items should be selected in such a way that the thief will carry those items for which he will gain maximum profit. Hence, the objective of the thief is to maximize the profit.
- Implement Program for fractional knapsack using Greedy design technique.
  Note: First solve the example:
  W=60

Item	A	B	C	D
Profit	280	100	120	120
Weight	40	10	20	24

Sample Input:-
p=[280,100,120,120]
w=[40,10,20,24]
W=60

Sample Output:-
Profit [100, 280, 120, 120]
Weight [10, 40, 20, 24]
Ratio [10.0, 7.0, 6.0, 5.0]
[1, 1, 0.5, 0]
Total profit : 440.0

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App.py

```
from flask import Flask, render_template, request

app = Flask(__name__)

def greedy_knap(p, w, mw):
    ratio = []
    for i in range(len(p)):
        ratio.append(p[i] / w[i])

    for i in range(len(ratio)):
        for j in range(len(ratio) - i - 1):
            if ratio[j] < ratio[j + 1]:
                ratio[j], ratio[j + 1] = ratio[j + 1], ratio[j]
                p[j], p[j + 1] = p[j + 1], p[j]
                w[j], w[j + 1] = w[j + 1], w[j]

    items_used = [0 for _ in range(len(p))]

    profit = 0
    for i in range(len(p)):
        if w[i] < mw:
            mw = mw - w[i]
            profit += p[i]
            items_used[i] = 1
        elif mw == 0:
            break
        elif w[i] > mw:
            j = mw * ratio[i]
            profit += j
            mw -= mw
            items_used[i] = j / p[i]

    return profit,items_used,p,w,ratio

@app.route('/', methods=['GET', 'POST'])
def index():
    if request.method == 'POST':
        profits = list(map(int, request.form['profits'].split()))
        weights = list(map(int, request.form['weights'].split()))
```

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```
        max_weight = int(request.form['max_weight'])

            max_profit  ,items_used  ,  sorted_profits  ,  sorted_weights  ,
sorted_ratio  = greedy_knap(profits,weights,max_weight)

          return  render_template('index.html' ,  max_profit  =  max_profit  ,
items_used = items_used ,sorted_profits = sorted_profits ,sorted_weights =
sorted_weights ,  sorted_ratio = sorted_ratio)

    return render_template('index.html')

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

Index.html

```
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>Greedy Knapsack Problem Solver</title>
    <style>
        body {
            font-family: Arial, sans-serif;
            margin: 0;
            padding: 0;
            background-color: #f4f4f4;
        }
        .container {
            width: 50%;
            margin: auto;
            padding: 20px;
            background-color: #fff;
            box-shadow: 0 0 10px rgba(0, 0, 0, 0.1);
            margin-top: 50px;
            border-radius: 8px;
        }
        h1 {
```

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```
            text-align: center;
            color: #333;
        }
        form {
            display: flex;
            flex-direction: column;
        }
        label {
            margin: 10px 0 5px;
        }
        input[type="text"], input[type="submit"] {
            padding: 10px;
            margin-bottom: 20px;
            border: 1px solid #ccc;
            border-radius: 4px;
            font-size: 16px;
        }
        input[type="submit"] {
            background-color: #28a745;
            color: white;
            cursor: pointer;
        }
        input[type="submit"]:hover {
            background-color: #218838;
        }
        .result {
            margin-top: 30px;
            padding: 20px;
            background-color: #e9ecef;
            border-radius: 8px;
        }
        .result h2 {
            color: #28a745;
        }
        .result p {
            font-size: 18px;
        }
    </style>
</head>
<body>
```

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```
    <div class="container">
        <h1>Greedy Knapsack Problem Solver</h1>

        <form action="/" method="post">
            <label for="profits">Enter Profits:</label>
            <input type="text" id="profits" name="profits" required>

            <label for="weights">Enter Weights:</label>
            <input type="text" id="weights" name="weights" required>

            <label for="max_weight">Enter Max Weight of Knapsack:</label>
            <input type="text" id="max_weight" name="max_weight" required>

            <input type="submit" value="Calculate">
        </form>

        <!-- Display result only if values are available -->
        {% if max_profit is not none %}
            <div class="result">
                <h2>Result</h2>
                    <p><strong>Sorted Profits:</strong> {{ sorted_profits
}}</p>
                    <p><strong>Sorted Weights:</strong> {{ sorted_weights
}}</p>
                <p><strong>Sorted Ratio:</strong> {{ sorted_ratio }}</p>
                <p><strong>Items Used:</strong> {{ items_used }}</p>
                <p><strong>Maximum Profit:</strong> {{ max_profit }}</p>
            </div>
        {% endif %}
    </div>
</body>
</html>
```

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Output: