Itisha Desai
Sem – 5
Branch – Cyber Security
Batch – CSE54
Enrollment No. – 22162171006

Algorithm Analysis and Design
Practical-9

Question :-

- 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

Code :-

app.py

```
from flask import Flask, render_template, request
app = Flask(__name__)

def fractional_knapsack(profits, weights, max_weight):
    items = [(profits[i] / weights[i], weights[i], profits[i]) for i in
        range(len(profits))]
    items.sort(reverse=True, key=lambda x: x[0])
    total_profit = 0.0
    remaining_weight = max_weight
     fractions = [0] * len(profits)
    for i in range(len(items)):
        if remaining_weight
                >=items[i][1]:
                total_profit +=
                items[i][2]
                remaining_weight -=
                items[i][1]
                fractions[i] = 1
        else:
```

```
        fraction = remaining_weight /
        items[i][1]
        total_profit += items[i][2] * fraction
        fractions[i] = fraction
         break
   return items, fractions, total_profit


@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(',')))
       max_weight = int(request.form['maxWeight'])
      items, fractions, total_profit = fractional_knapsack(profits, weights,
max_weight)

         return render_template('index.html', items=items,
fractions=fractions,
         total_profit=total_profit)


          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 http-equiv="X-UA-Compatible" content="IE=edge">
   <meta name="viewport" content="width=device-width, initial-
scale=1.0">
   <title>Fractional Knapsack Problem Solver</title>
   <style>
body {
        font-family: Arial, sans-serif;
        margin: 20px;
        text-align: center;
      }
      .container {
max-width: 600px;
margin: 0 auto;
background-color:
#f2f2f2;
          padding: 20px;
border-radius: 8px;
          box-shadow: 0 0 10px rgba(0, 0, 0, 0.1);
      }
      input, button {
margin: 10px 0;
padding: 10px;
width: 80%;
      }
      .result {
```

```
        margin-top: 20px;
text-align: left;
      }
   </style>
</head>
<body>
   <div class="container">
      <h2>Fractional Knapsack Problem Solver</h2>
      <form method="POST">
         <label for="profits">Enter Profits (comma separated):</label><br>
         <input type="text" id="profits" name="profits" placeholder="e.g.,
280,100,120,120" required><br>

         <label for="weights">Enter Weights (comma
separated):</label><br>  <input type="text" id="weights" name="weights"
placeholder="e.g., 40,10,20,24" required><br>

         <label for="maxWeight">Maximum Weight the Knapsack can
carry:</label><br>
         <input type="number" id="maxWeight" name="maxWeight"
placeholder="e.g., 60" required><br>

         <button type="submit">Calculate</button>
      </form>

      {% if items %}
      <div class="result">
         <h3>Results</h3>
```

```
        <p><strong>Profit:</strong> [{{ items|map(attribute=2)|join(', ')
}}]</p>
        <p><strong>Weight:</strong> [{{ items|map(attribute=1)|join(', ')
}}]</p>
        <p><strong>Ratio:</strong> [{{ items|map(attribute=0)|join(', ')
}}]</p>
        <p><strong>Fractions Taken:</strong> [{{ fractions|join(', ') }}]</p>
        <p><strong>Total Profit:</strong> {{ total_profit }}</p>
      </div>
      {% endif %}
    </div>
</body>
</html>
```

Output :-