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Sub: Algorithm Analysis & Design

Branch: CS

Batch: 54

Sem: 5-B

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 artifact 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

app = Flask(__name__)

def knapsack(W, wt, val, n):
    K = [[0 for x in range(W + 1)] for x in range(n + 1)]

    for i in range(n + 1):
        for w in range(W + 1):
            if i == 0 or w == 0:
                K[i][w] = 0
            elif wt[i-1] <= w:
                K[i][w] = max(val[i-1] + K[i-1][w-wt[i-1]], K[i-1][w])
            else:
                K[i][w] = K[i-1][w]

    res = K[n][W]
    w = W
    selected_items = []
```

```
    for i in range(n, 0, -1):
        if res <= 0:
            break
        if res == K[i-1][w]:
            continue
        else:
            selected_items.append(i)
            res -= val[i-1]
            w -= wt[i-1]

    return K, K[n][W], selected_items

@app.route('/')
def knapsack_solution():
    val = [3, 4, 5, 6]
    wt = [2, 3, 4, 5]
    W = 5
    n = len(val)

    K, max_value, selected_items = knapsack(W, wt, val, n)

    return render_template('Prac_7.html', K=K, W=W, n=n, max_value=max_value,
selected_items=selected_items)

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

Output:

Knapsack Solution Table

	W = 0	W = 1	W = 2	W = 3	W = 4	W = 5
i = 0	0	0	0	0	0	0
i = 1	0	0	3	3	3	3
i = 2	0	0	3	4	4	7
i = 3	0	0	3	4	5	7
i = 4	0	0	3	4	5	7

Maximum Value: 7

Selected Artefacts (by index):

[2, 1]