CSE 204: Data Structures and Algorithms I Sessional

Assignment 8: Dynamic Programming

0-1 Knapsack Problem

During a robbery, a burglar finds much more loot than he had expected and has to decide what to take. His bag (or "knapsack") will hold a total weight of at most W kg. There are n items to pick from, of weights $w_1,...,w_n$ and values $v_1,...,v_n$. You need to implement an algorithm to find the most valuable combination of items the burglar can fit into his bag if taking fractions of the items are not allowed. The running time of your algorithm should be $O(nW)$

Input format:
The first line will contain an integer n denoting the number of items. The next n lines will each contain 2 numbers separated by space where the first number denotes the weight of the corresponding item and the second its value (both will be integers). Finally, the last line will contain an integer W denoting the total weight of the bag.

Input will be given in a file named **input.txt** .

Example: input.txt

```
4
20 40
10 100
40 50
30 60
60
```

Output format:

The first line of the output will be the total value of items taken. The second line will be weights of the items taken separated by spaces.

Output should be in a file named **output.txt** .

Example: output.txt

```
200
20 10 30
```

Submission Guidelines:

1. Create a directory with your 7-digit student id as its name.
2. Put all the source files only into the directory created in step 1.
3. Zip the directory (compress in .zip format. Any other format like .rar, .7z etc. is not acceptable).
4. Upload the .zip file on Moodle in the designated assignment submission link. For example, if your student id is xx05xxx, create a directory named xx05xxx. Put only your source files (.c, .cpp, .java, .h etc.) into xx05xxx. Compress the directory xx05xxx into xx05xxx.zip and upload the xx05xxx.zip on Moodle.

Failure to follow the above-mentioned submission guideline may result in up to 10% penalty.

Submission Deadline: 10/02/2023 11:59PM

Plagiarism Policy: You will be penalized with -100% if any sort of plagiarism is found.