United International University (UIU)
Dept. of Computer Science & Engineering (CSE)
CSE 2218 Spring 2023 Final Exam Marks: 15

**You have to answer here. No extra page will be provided.**

**Set B**

**Any examinee found adopting unfair means will be expelled from the trimester/program as per UIU disciplinary rules.**

## Instructions:

- Write the code by yourself. **Do not adopt any unfair means (No help from the internet, any human, or any existing code written by you or any one else is allowed).**
- Submit the code/codes in ELMS.
- Given hints are not the full solution of the problems.
- There are **two** questions. Answer all of them.

## Question 1 [7.5]

Write a **dynamic programming solution** for the following scenario:

You are running a server with **X** GB RAM. You allow people to use this server for money. Suppose, **N** customers want to run their program on your server tomorrow. The **i**-th customer wants to pay **M_i** taka and his/her program will take **Y_i** GB RAM. It is possible that you cannot accommodate all customers' requests due to limited RAM. **Which customers' requests should you keep so that your profit is maximized? What is the maximum profit?**
Assume, M_i and Y_i are integers.

| Sample Input<br>N<br>M_1 Y_1<br>…<br>M_N Y_N<br>X | Sample Output |
|---|---|
| 5<br>33 23<br>67 12<br>21 14<br>19 25<br>51 19<br>50 | Maximum profit 139 taka<br>Keep the following requests<br>customer 2<br>customer 3<br>customer 5 |
| 4<br>3 2<br>7 2<br>2 4<br>9 5<br>10 | Maximum profit 19 taka<br>Keep the following requests<br>customer 1<br>customer 2<br>customer 4 |

## Question 2 [7.5]

Write a **greedy solution** for the following scenario:

You have two aunts Maria and Daisy, and **N** cousins. On Eid, your aunt Maria gave you **X1** taka and aunt Daisy gave you **X2** taka. Aunt Maria gave you **N** envelopes to distribute among your cousins, the **i**-th one containing **M_i** taka. Aunt Daisy also gave you **N** envelopes to distribute among your cousins, the **i**-th one containing **D_i** taka. **Find out if it is possible to distribute them in such a way that no cousin in total gets more money than you.**

**Hint:** Sort the envelopes given by aunt Maria, Sort the envelopes given by aunt Daisy.

| **Sample Input**<br>**N X_1 X_2**<br>**M_1 M_2 ... M_N**<br>**D_1 D_2 ... D_N** | **Sample Output** |
|---|---|
| 5 6 6<br>2 3 4 1 5<br>2 1 9 8 5 | yes |
| 4 6 6<br>5 5 5 5<br>1 1 2 1 | no |

Example code snippet for sorting:

```
#include <algorithm>
#include <cstdio>
#include <iostream>
using namespace std;
struct Pair
{
    int a, b;
};
bool comp(Pair p1, Pair p2)
{
    return p1.b < p2.b;
}
int main()
{
    /* an array of struct */
    Pair arr[] = {{5, 100}, {3, 9}, {3, 12}, {1, 6}, {5, 5}, {8, 16}};
    int n = sizeof(arr) / sizeof(arr[0]);
    /* sort the array */
    sort(arr, arr + n, comp);
    /* print the array */
    for (int i = 0; i < n; i++)
    {
        printf("a:%d b:%d\n",arr[i].a, arr[i].b);
    }

    return 0;
}
```