B4M35KO, BE4M35KO
Practical Test – Painting the neighborhood

1 Test Assignment

A group of neighbors decided to renew the painting of their houses. To do that, they noticed that the local home improvement store sells a set of barrels C with mutually different painting colors. Each barrel of paint $j \in C$ is available in the volume of $v_j \in \mathbb{Z}_0^+$. One unit of the volume is enough to paint one house. However, some of the colors are fancier; thus, they are more costly. Therefore, the price for one unit of barrel type $j \in C$ costs $c_j \in \mathbb{Z}_0^+$ CZK.

The neighbors want a diverse and colorful town. Thus, they have agreed that if two houses are next to each other, then each should use painted with a different color. Therefore, they built a map of their neighborhood $G = (V, E)$, which specifies if two houses $u, v \in V$ are next to each other, denoted as $(u, v) \in E$.

Your task is to paint the neighborhood such that

1. no two adjacent houses have the same painting,

2. the volumes of available barrels for each paint are not exceeded,

3. the total cost of the used paint is minimized.

Consider the following example. The neighbors are able to get three type of barrels of paint $C = \{\textbf{blue}, \textbf{red}, \textbf{green}\}$. The **red** paint is cheapest ($c_{red} = 1$), but we have only $v_{red} = 2$ units of it. On the other hand, we have plenty of **green** paint, ($v_{green} = 6$), but is the most expensive one ($c_{green} = 8$). Furthermore, we have also a bit of **blue** paint, enough to paint three houses ($v_{blue} = 3$) with the price $c_{blue} = 3$ per house. See the optimally painted neighborhood in Figure 1.
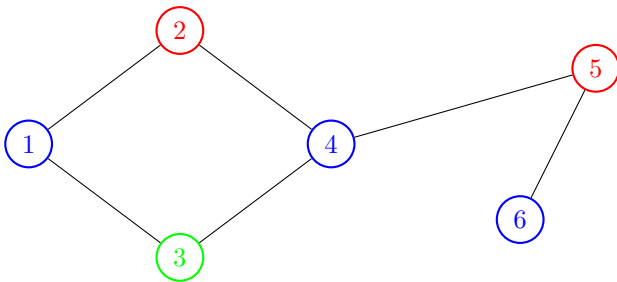

Figure 1: Optimally painted houses in the neighborhood with the total cost 19.
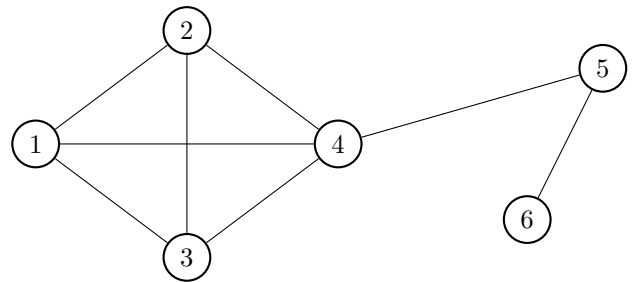

Figure 2: A neighborhood that cannot be painted with C.

However, if they fail to obtain enough of the different barrels of the paint in the sufficient amount, then it might be impossible to paint their houses. For example, with the same barrels C as in the previous example, the neighborhood in Figure 2 cannot be painted.

2 Assignment Evaluation (max. 8 points)

Upload your code to BRUTE. If your program passes all the tests, you will obtain full 8 points. Supported programming languages are C++, Java and Python (see `https://cw.fel.cvut.cz/wiki/courses/ko/upload_system` for more details).

Your program will be executed with two arguments: the first one is absolute path to input file and the second one is the absolute path to output file (the output file has to be created by your program).

2.1 Input File

The input file specifies the number of n houses in the neighborhood, the number of pairs of houses that are adjacent m and the number of available types of barrels c with the paint. Starting at the second line, each line specifies the parameters of the barrel with the paint — the unit cost c_i and the total volume v_i of the barrel

type i. After the description of the barrels, the map of the neighborhood follows, given as the list of m pairs of houses that need to be painted with different barrels. The indices of houses are integers between 1 and n.

```
n m c
c_1 v_1
...
c_c v_c
u v
v w
...
```

2.2 Output File

If the neighborhood cannot be painted, then the output contains a single line with -1. Otherwise, output n lines, where i-th line contains a single integer corresponding to the barrel that was used to paint house $i \in V$. The index of the barrel is an integer between 1 and c.

```
1
2
3
...
```

3 Examples

First two examples correspond to the Figures 1 and 2.

3.1 Example 1

Input:

```
6 6 3
3 3
1 2
8 6
1 2
3 1
4 3
2 4
4 5
5 6
```

Output:

```
1
2
3
1
2
1
```

3.2 Example 2

Input:

```
6 8 3
3 3
1 2
8 6
1 2
3 1
2 4
3 4
4 5
5 6
2 3
4 1
```

Output:

```
-1
```

3.3 Example 3

Quite lonely neighborhood.

Input:

```
5 0 2
7 4
14 10
```

Output:

```
1
1
1
1
2
```