Farmers' markets

Submission deadline:	**2018-10-28 23:59:59**
Evaluation:	**7.5000**
Max. assessment:	**2.0000** (Without bonus points)
Submissions:	8 / 40
Advices:	0 / 0

During the last few years people have benefited from the growth of farmers' markets, which allow city residents to break free from routine of foods offered in large food chains. Because people have started to orientate themselves on domestic products of high quality, the popularity of farmers' markets grows steeply along with demand for such markets in outlying cities. This, of course, pleases managers of the logistic company which provides transport of foods to markets. On the other hand, the situation makes them a little worried. That is because it is harder and harder for them to maintain current quality of markets while minimizing operational expenses to keep the transport profitable.

It is therefore needed to precisely schedule transport of foods to markets, which has become impossible with the growth of the network of markets. Managers of the company thus called you to their aid. In particular, for a given network of cities and location of foods within it, it is needed to schedule how to effectively distribute foods among cities, so the food supply at farmers' markets in each city remains interesting enough. Precisely, the target is to ensure there is at least given minimal amount of different sorts of food in each city. Also, the transport of foods must minimize total transport fee, which depends on distance of cities participating in transport.

You will be given a network of cities (that is list of cities and roads in between them) altogether with the location of foods, the number of different sorts of food, and minimal number of sorts of food in order to ensure a farmers' market is interesting enough. There is exactly one sort of food available in each city (not necessarily unique among all cities) in an unlimited quantity (it is thus possible to transport given sort of food from a particular city any number of times). Each sort of food is located in at least one city. The number of different sorts of food is rather small; you can assume this number is never larger than 100. Roads connecting cities are bidirectional. No road connects a city with itself. It is possible to get from every city to any other by using roads. The price to transport a particular sort of food from a city x to city y is equal to the length of shortest path between cities x and y measured by the number of roads in between them. To ensure the freshness of foods, it is not allowed to use cities as a transship point. This means the transport of a particular sort of food is allowed only from cities, in which the given sort was located before the transport begun. It is possible there are multiple solutions which minimize the total cost of transport, but differ in the sorts of food transported in cities. In such case output an arbitrary solution.

Input Format:

- On the first line there are two numbers; number N specifying the number of cities in the network and number M specifying the number of roads in the network.
- On the second line there are again two numbers; number P specifying number of different sorts of food and number Q specifying minimal number of sorts of food in order to ensure a market is interesting.
- For all levels of tests $1 \leq Q \leq P \leq \min(N, 100)$ holds.
- The numbering of both cities and sorts of food is zero-based; their numbers are thus $0, 1, \ldots, N - 1$, resp. $0, 1, \ldots, P - 1$.
- On the next line there are N numbers $a_0, a_1, \ldots, a_{n-1}$, $0 \leq a\_i < P$. i-th number a_i specifies the sort of food, which is available in i-th city.
- After that M rows follow, specifying roads in between cities. On each such row there are two numbers x and y, $0 \leq x, y < N, x \neq y$, specifying there is a road between cities x and y.
- No road is listed multiple times.
- The network always consists of at least single city, but does not have to contain a road.
- You can assume the input is valid.

Output Format:

- Output consists of `N + 1` rows. On the first row output minimal fee needed to ensure interestingness of farmers' markets in all `N` cities. On each of following `N` rows output `Q + 1` numbers. On `i`-th such row first output minimal fee needed to to ensure interestingness of the farmers' market in `i`-th city. The following `Q` space-separated numbers should specify the sorts of food used in `i`-th city (these numbers may be listed in an arbitrary order).

Classification Conditions:

1. To pass the compulsory tests (basic and small data tests), your solution has to return correct answers for networks of at most 10 cities and 20 roads.
2. To pass the test on medium dataset, your solution has to output correct answers within the time and memory limit for networks of at most 1 000 cities and 1 000 roads.
3. To pass the test on large dataset, your solution has to output correct answers within the time and memory limit for networks of at most 100 000 cities and 1 000 000 roads.

Examples:

Input example 1:

```
5 5
4 3
0 1 3 2 1
0 1
2 1
2 3
3 0
4 3
```

Output example 1:

```
11
2 0 1 2
2 1 0 3
2 3 1 2
2 2 0 1
3 1 2 0
```

Input example 2:

```
3 2
1 1
0 0 0
0 1
1 2
```

Output example 2:

```
0
0 0
0 0
```