ESO207	Assignment 4	Summer Semester, 2017

Due Date: 10am on 14th July, 2017 **Maximum Marks: 60**

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1. (10 points) For a graph $G = (V, E)$, define

$$s(G) = \max_{u,v} \operatorname{dist}(u, v)$$

where $\operatorname{dist}(u, v)$ is the distance between u and v in G.

Given an undirected, connected, acyclic graph $G = (V, E)$ design an $O(|V|)$ algorithm to compute $s(G)$.

2. (10 points) A vertex s in a directed graph $G = (V, E)$ is called a sink if for every vertex $v \in V \setminus \{s\}$, there exists an edge from v to s and s does not have any outgoing edge. Given the adjacency matrix of a graph $G = (V, E)$ give an $O(|V|)$ algorithm that checks if G has a sink. Give an analysis of the time complexity and prove the correctness of your algorithm.

3. (20 points) (**Programming Question**) Given a list of N names, find a permutation of characters of the alphabet such that these N names are in lexicographic order with respect to that permutation. If no such permutation exist, print "IMPOSSIBLE".

Lexicographical order is defined in following way. When we compare two strings s and t, first we find the leftmost position with differing characters: $s_i \neq t_i$. If there is no such position (i. e. s is a prefix of t or vice versa) the shortest string is lexicographically lower. Otherwise, we compare characters s_i and t_i according to their order in alphabet.

Input: Integer N for the number of names N names without spaces, all in small characters.
Output: Print the permutation of the characters such that these names are in lexicographic order. If multiple such permutations are possible then output the one that is lexicographically lowest.

Constraints: $1 \leq N \leq 1000$ and $1 \leq |name| \leq 100$

Examples

Input	Output
7 motwani hopcroft ullman cormen stein rivest leiserson	abdefgijkmhucsrlnopqtvwxyz
4 raj ram ramesh rajesh	IMPOSSIBLE
4 chennai delhi kolkata mumbai	abcdefghijklmnopqrstuvwxyz

4. (20 points) (**Programming Question**) A city contains 3 types of roads (1, 2 and 3) which join the sectors of the city. Road type1 is used by two wheelers only, road type 2 is used by four wheelers only and road type 3 is used by both.

The mayor need to destroy some roads so as to reduce the expense on maintenance of roads. What is the maximum number of roads that can be destroyed such that the city will be still connected for both X and Y.

Note: Connected city is a city where it's possible to travel from any sector to any other using existing roads. All the roads are bidirectional.

Input
T: No. of test cases.
NM: N sectors and M roads.
Then M lines contains three space separated integers containing description of each edge i.e joining sectors and road type.

Output
Maximum number of roads you can destroy

Constraints
$1 \leq T \leq 10$
$1 \leq N \leq 100$
$1 \leq M \leq 10000$

Sample input
```
1
5 7
1 2 3
2 3 3
3 4 3
5 3 2
5 4 1
5 2 2
1 5 1
```

Sample Output
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2
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