

Lab 4 - OJ - Graphs

CS208 Algorithm Design and Analysis

Yang Xu

xuyang@sustech.edu.cn

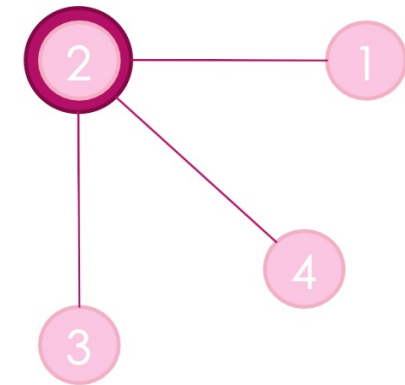
Slides adapted from Yao Zhao zhaoy6@sustech.edu.cn

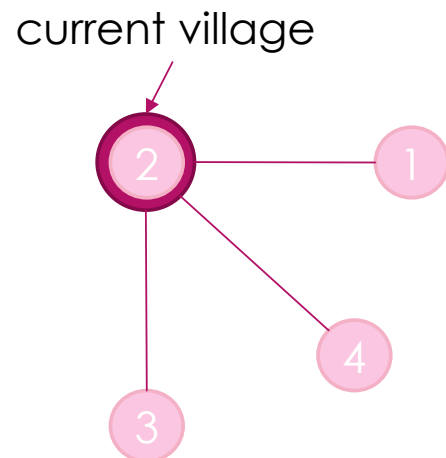
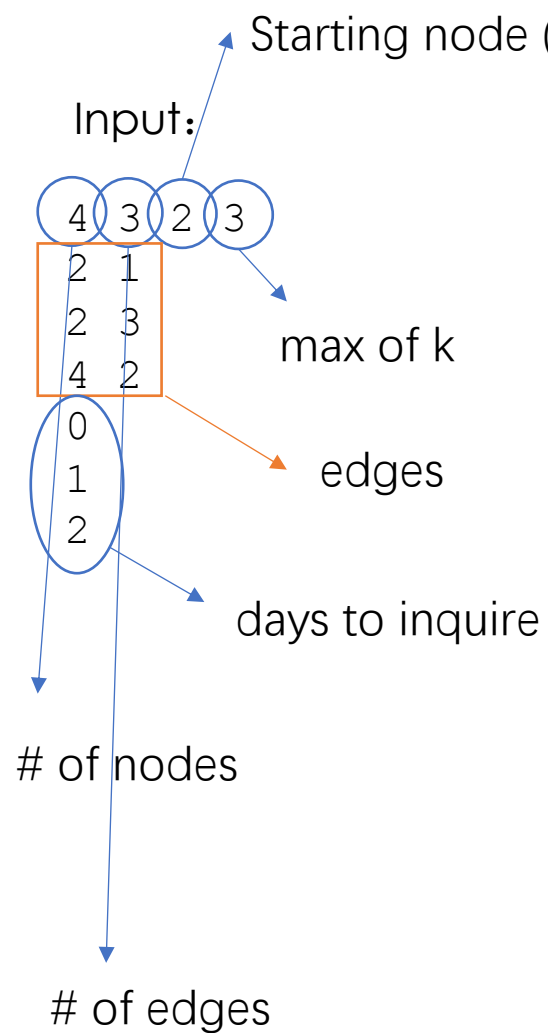
Question 1. Pay a new year call (拜年)

XX lives in a town composed of n villages (numbered 1, 2, 3, ... , n respectively), and m roads (each road connects two villages), of which the number of XX's village is p ($p \in [1, n]$).

On the first day of the New Year, XX starts from his village and goes to another village to pay New Year's call through the road connected with his village. XX can also either go through the road he has passed or stay in her current village.

Could you tell me the number of villages that XX might stay on the day k ?





Which villages XX
may stay on

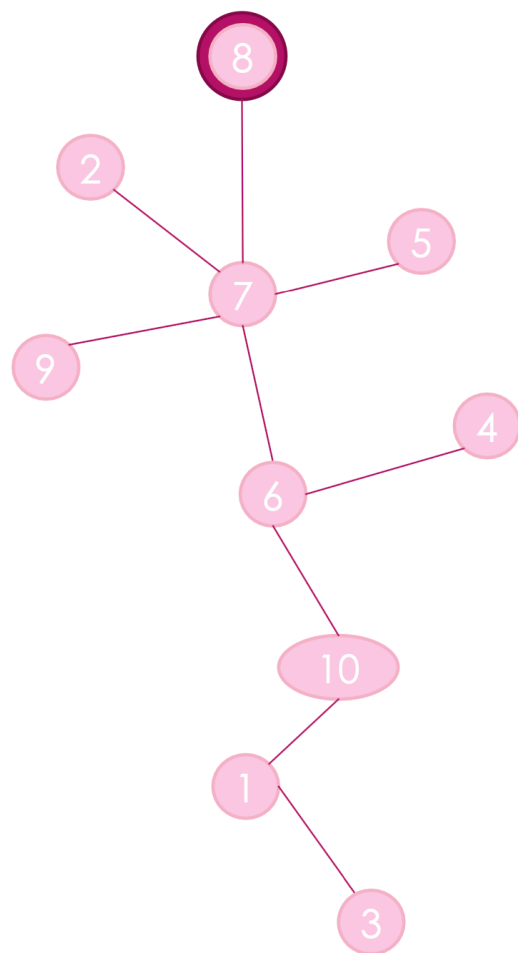
day 0:	2
day 1:	2,1,3,4
day 2:	2,1,3,4

the number of villages

1
4
4

Output:

1 4 4



Input

10 9 8 20
8 7
6 7
4 6
5 7
2 7
1 10
10 6
3 1
9 7
1
3
5
8
11
10

Output:

2 8 10 10 10 10

Question 2. Determining bipartite (二分图)

Given an undirected connected graph, determine if the undirected graph is a bipartite graph.

Input Format

The first line contains an integer T denotes the numbers of graphs in this testcase.

All the following lines describe the T graphs. Each graph begins with two integers n, m , denoting the number of vertices (nodes) and edges in the graph.

Then next m lines are describing the m edges, each of which contains two integers u_i and v_i ($1 \leq u_i, v_i \leq n$), indicating the two vertices connected by the i -th edge.

There may be multiple edges (i.e., two or more edges connecting two vertices) and self-loops (i.e., a vertex connecting to itself).



Question 2. Determining bipartite (二分图)

Output Format

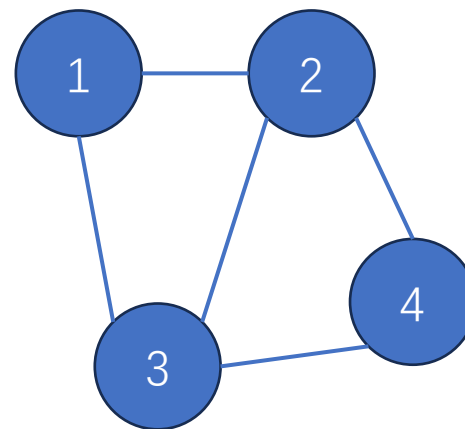
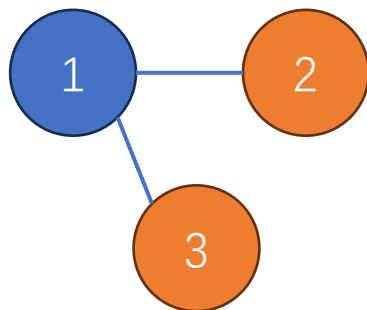
T lines.

Each line outputs **true** or **false** to indicate whether the graph is a bipartite graph.

Sample

Sample Input 1

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



Sample Output 1

```
true
false
```