There are 1 questions for a total of 18 points.

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(18) 1. <u>Even length paths</u>: Given a directed acyclic graph $G = (V, E)$ and a vertex u, design an algorithm that outputs all vertices $S \subseteq V$ such that for all $v \in S$, there is an even length simple path from u to v in G. *(A simple path is a path will all distinct vertices.)*

You have to implement your algorithm for the above problem. Your program should take input from a file named `input.txt` and should write the output in a file named `output.txt`. Your program should produce an output within 15 seconds for this assignment. The format for input and output files is as follows.

<u>INPUT</u>: The first line of the input file gives the number of vertices n (assume $n \le 1000$) in the input graph. n lines follow this where the ith line contains the adjacency list of the ith vertex. The last line contains the vertex u. Below is an example of an input file.

```
6
v1->v2
v2->v3
v3->v4
v4->v5
v5->v6
v6
v1
```

<u>OUTPUT</u>: The first line of the output should contain the number of vertices being produced as output. This should be followed by a line containing the output vertices separated by commas. This line should have vertices in increasing order of their number. For example, consider the output file corresponding to the input file above:

```
3
v1,v3,v5
```

<u>SUBMISSION INSTRUCTIONS</u>: All your program files should be in a directory named ⟨ Your entry⟩ `hw2_prog`. You will be asked to create a zip of this directory and submit this zip file. In this directory, there should be a makefile that will compile your code (read about makefile on the net in case you do not know what it is). After running `make`, the directory should have an executable called `evenpath`. This, when executed, should read the input file (`input.txt`) and write the answer in the output file (`output.txt`).

Figure 1: Example input graph.