12) The *diameter* of a tree is the maximum distance between any two vertices. Given a connected, undirected graph, write an algorithm for finding a spanning tree of minimum diameter. Prove the correctness of your algorithm.

First, to find the diameter of a tree, we can use the method that enumerate edge set. each edge has the choose include "choose" and "not choose". Second, we think about the definition of the tree. every node must be connected with and there is no ring exist. In this case. this nodes can form a tree. Third. we examinate all the edge set for the maximum distance between any two vertice (the diameter). and update the minimum of diameter. Finally. we can found the result we want.

(1) Enumerate edge set.

"choose" and "not choose". we can use a vector contain 0/1 to (0/1. 0/1. 0/1 ... . 0/1) represent.

In mode of operation on the computer. computer store all the integer in binary. so the (0/1) vector with size m. we can use the number bigger than m-bit to represent

EX. $000\ldots000_{(2)} = 0_{(10)} \sim 111\cdots111_{(2)} = 2^m - 1$

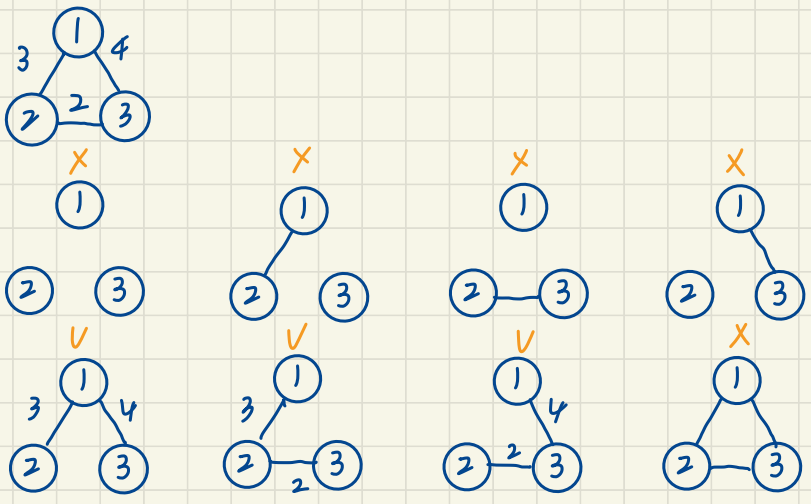
(2) Check if it form a tree

choose one node and select an edge set. then visit all the node it can arrive. define a variable to remember how many node have been visit. if the numbe equal to the number of node. it form a tree. (Can use DFS to do).

(3) Examinate the minimum diameter

by (1). we can ensure that we can run every case of the edge set. calculate the diameter for each case. the choose the minimum one. it would be the answer we want. (If there are weight for the edge. we should consider it).

EX.



∴ the minimum diameter = 6