BFS and DFS

Tutorial 10

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Breadth First Search

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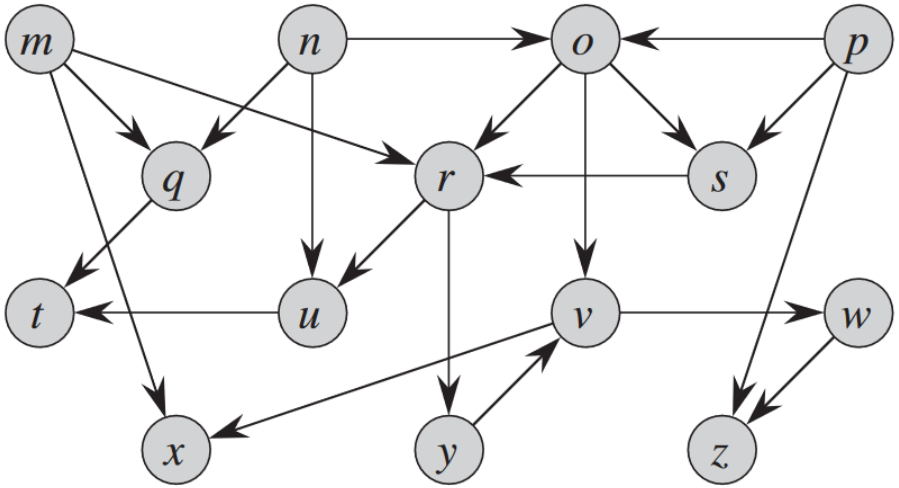
Perform a BF search of the graph with m as the starting vertex. Write the order in which vertices are added to the queue.



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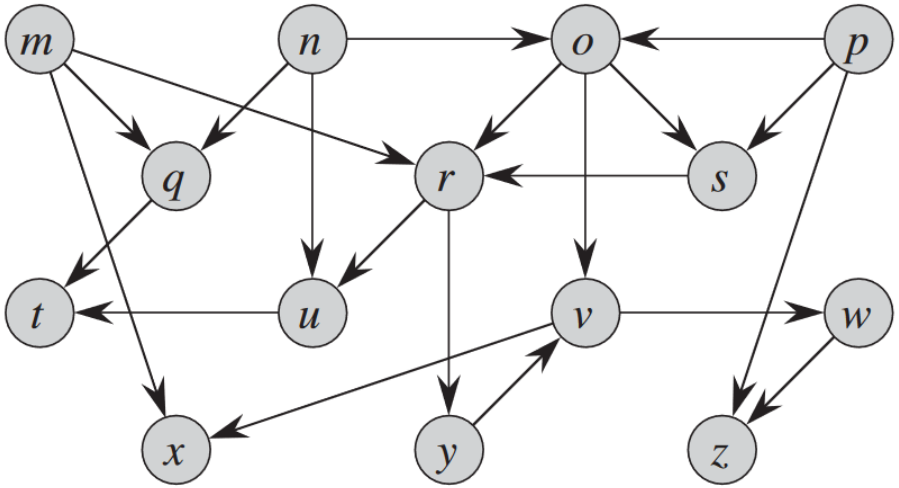

One possible vertex order in queue:

m->x->q->r->t->u->y->v->w->z

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5. If one performs a level order traversal, is it the same as BFS?

Depth First Search

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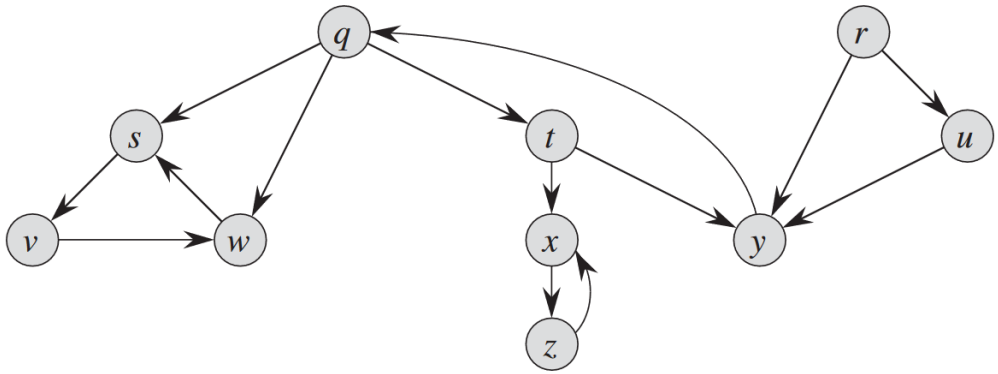
Perform a DF search of the graph with q as the starting vertex. For each node write the time step in which you enter the node to perform a recursive DFS and the time step at which you return out of the node.



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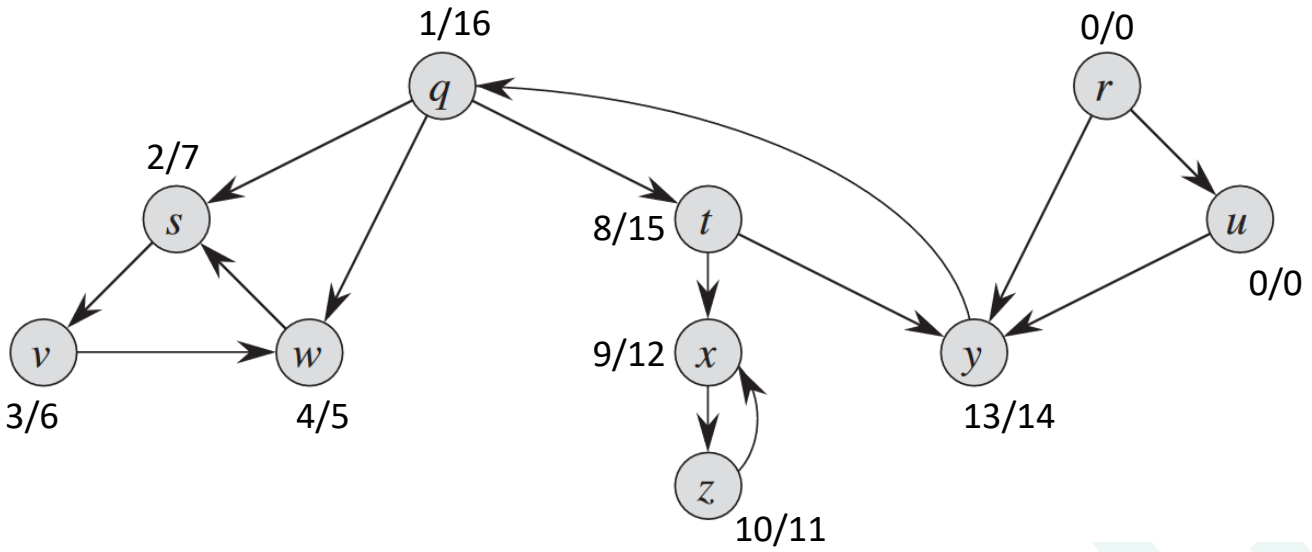

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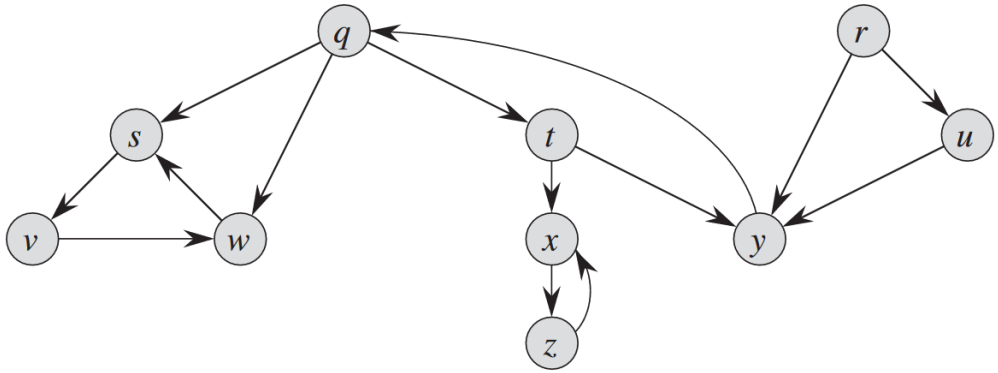
2. Which graph representation is more suited for DFS?
3. We know of multiple order traversals. Does anything resemble to DFS?

Strongly Connected Components using DFS



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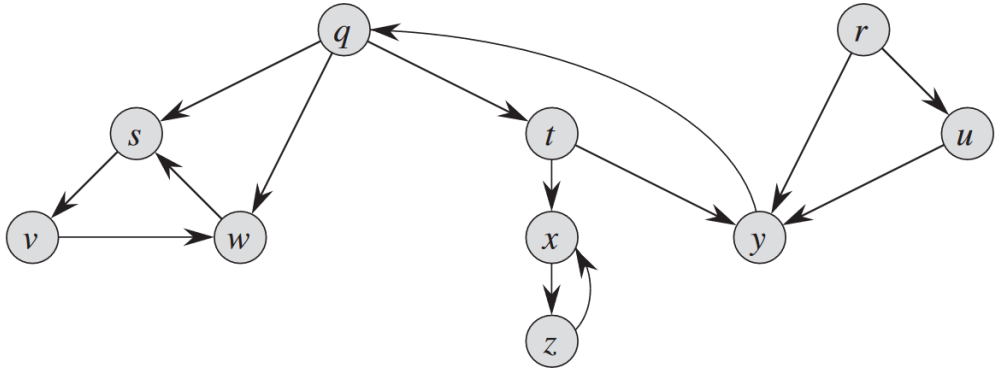
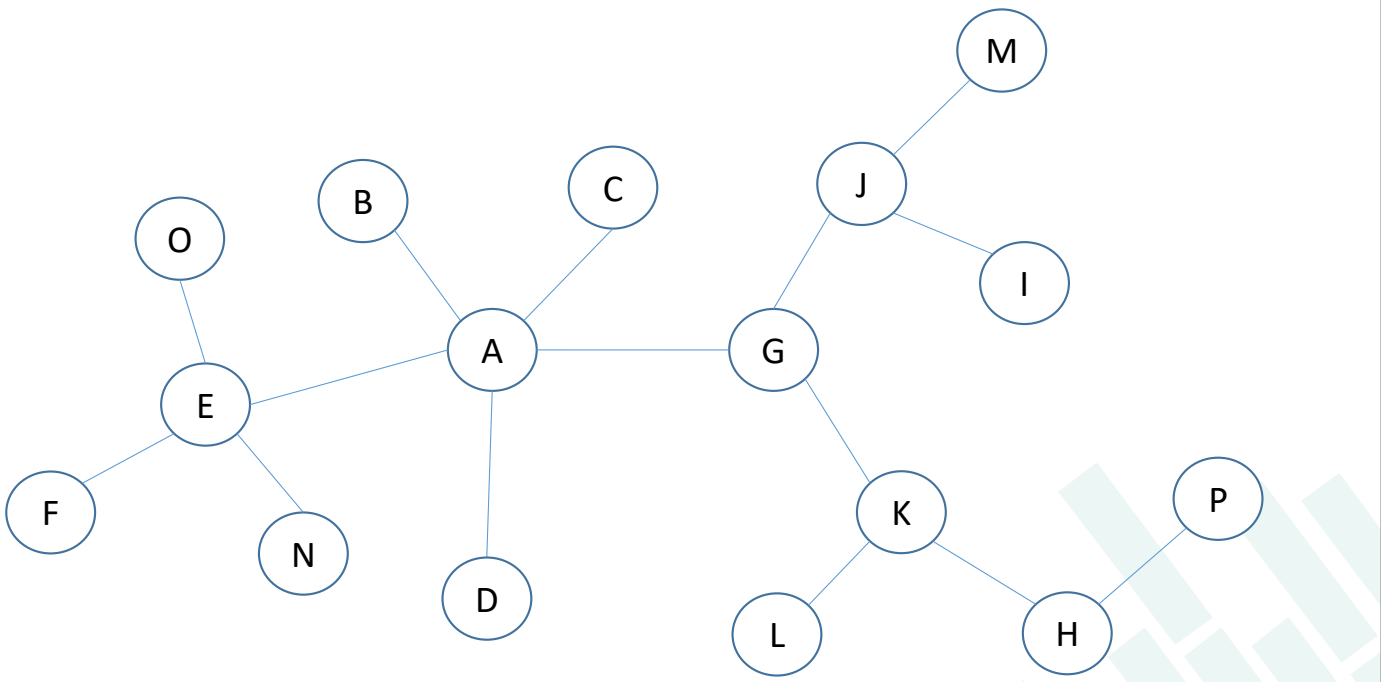


There are a total of 5 strongly connected components.
The vertex sets of those components are {r}, {u}, {q, y, t}, {x, z} and {s, w, v} .

Questions

Question

Find the minimum and maximum depth of the tree.



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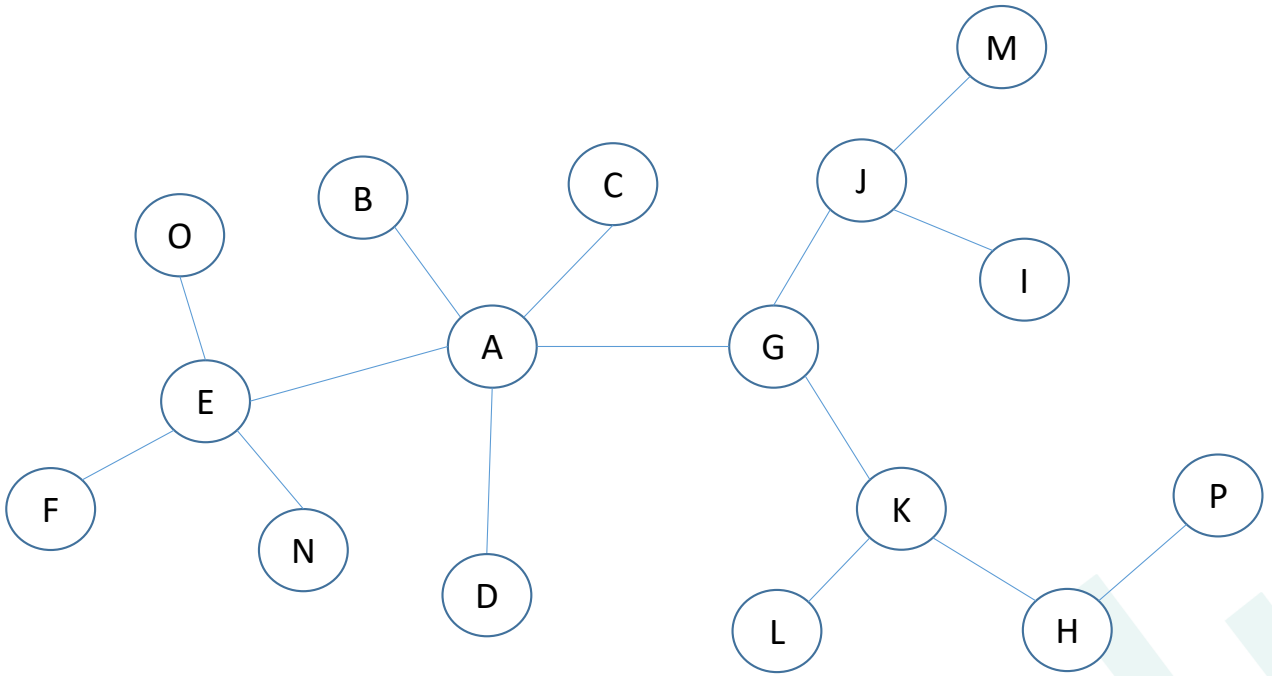

Hint : BFS/DFS for maximum and BFS for minimum.

Question

You are given an array (1 indexed) of whole numbers. You are to start from 1st index and reach the nth index of the array. But you are allowed to do only two possible movements:

I. Move to index i+1 from i.
II. Move to index i+A[i] from i.

What is the least number of jumps you need to make to reach the nth index?

A = [3, 1, 2, 0, 5, 1, 5, 3, 2, 1]

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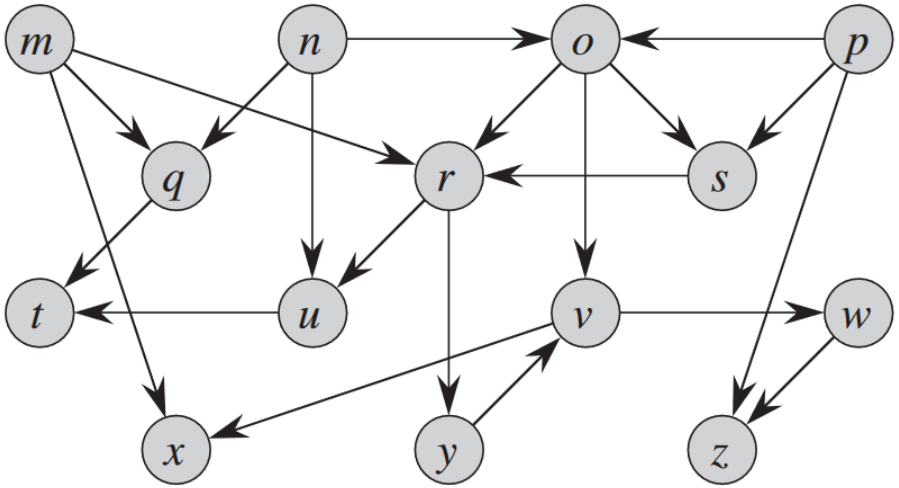
Hint : Construct a graph with jumps as edges and indices as vertices and find shortest path to nth index.

Question

Is there a cycle in this graph?



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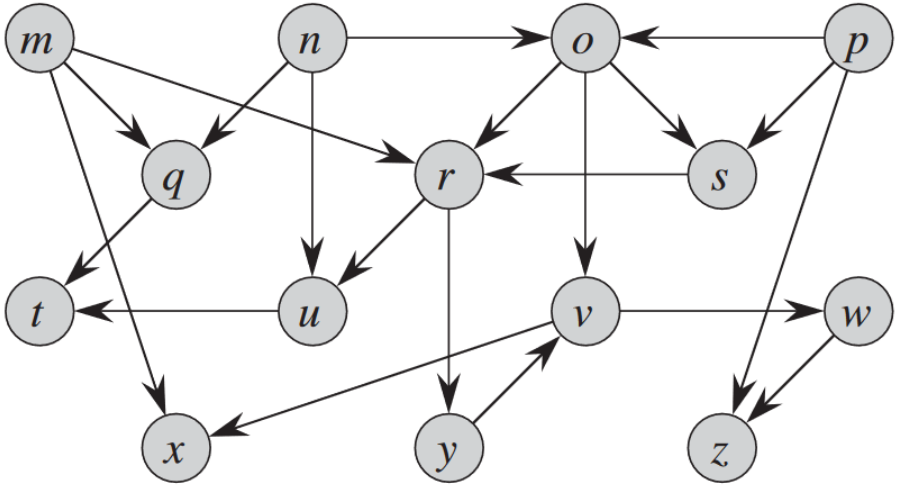

Hint : DFS and check if there is an unexplored edge from a DFS child to its parent.

Question

Say there are only 5 cities in a country that have airport access. However, flights do not go between all pairs of cities. You would like to travel to all the 5 cities. Would it be possible for you to travel to all the cities only via flights if you randomly choose a city to start with?

The cities are named 0, 1, 2, 3 and 4 and the available flights are the ones that fly as 1 -> 0, 0 -> 2, 2 -> 1, 0 -> 3, 3 -> 4 and 4 -> 0.

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Hint : How many strongly connected components does this graph have?

Thank You