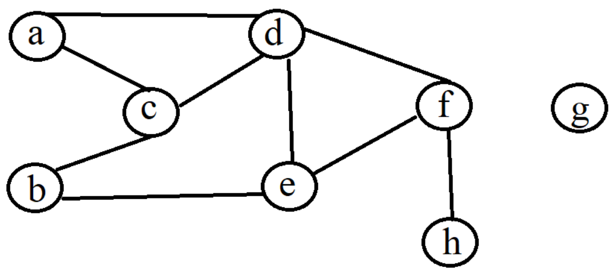
Programming assignment 7.
Due date: Wednesday, April 29, 2020 at 11:59pm

Note: you can have different names for vertices: {a b c d e ..} = {v1 v2 v3 v4 ..} = {1 2 3 4 ..}

In this program you are required to implement BFS.

First, you can create the below graph and print the resulting adjacency matrix/list. Or create a random graph.

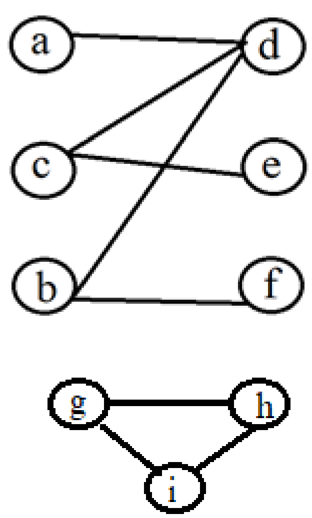


Part A.

1. Request the user to determine the starting vertex (*a*) for **BFS** algorithm
2. Call *BFS* function to find the vertices reachable from vertex *u* and print the *shortest paths* and their *lengths/distances*.

Part B.

In this part you are required to determine if a random undirected graph is bipartite or not. You can use the below graph to test.



Here, we work with three colors for the vertices: *gray* (not visited), [*blue, red*] (**opposite colors**)

1. Print the resulting adjacency matrix/list.
2. Implement 2 functions: *Explore* and *Is_bipartite*
3. In ***Explore*** function,
   a. For each vertex (v) initialize *v.color = "gray".*
   b. Start from the first vertex, color it *"blue"* and call *Is_bipartite* on that.
   c. Next, go to the next unexplored vertex (having *gray* color), color it *"blue"* and call *Is_bipartite* again.
   d. Repeat *step c.* until every vertex is explored/colored or a not bipartite graph is detected.
4. Now to implement our second function (***Is_bipartite***), you need to change your BFS function in part A.
   a. Keep popping each vertex from *Q*. (call it **u**)
   b. Go to the adjacency list of **u**, (adj(u)), and for each neighbor (**v**):
   c. If ***v***. *color == "gray"*, assign an opposite color to **v** and push it into the *Q*. (**Example**: ***u****.color* is *blue*, and ***v****.color* is *gray* ➔ we set ***v****.color = "red"*)
   d. Else if ***v****.color* == ***u****.color*: Stop the entire code and print "**NOT bipartite**".
5. Print the color of all the vertices.