Graph Traversal

[No Submission]

Instructions for students:

- You may use any language to complete the tasks (Java / Python).

NOTE:

- **YOU CANNOT USE ANY BUILT-IN FUNCTION EXCEPT len IN PYTHON. [negative indexing, append is prohibited]**
- **YOU HAVE TO MENTION SIZE OF ARRAY WHILE INITIALIZATION**

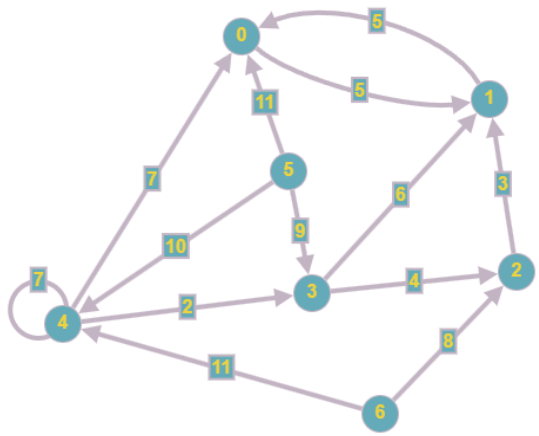
Dear Students, you have been given instructions and driver code for the majority of the labs. For the last three labs of this semester, no driver code will be given. You will develop everything (necessary functions, class, driver code, etc.) in your preferred language (Java or Python).

[Design graphs according to your preference to solve the tasks]

Task 1:

Implement the BFS algorithm to traverse a Directed Weighted graph represented by Adjacency Matrix.

SAMPLE GRAPH & Starting Vertex




```
 0,  5,  0,  0,  0,  0,  0
 5,  0,  0,  0,  0,  0,  0
 0,  3,  0,  0,  0,  0,  0
 0,  6,  4,  0,  0,  0,  0
 7,  0,  0,  2,  7,  0,  0
11,  0,  0,  9, 10,  0,  0
 0,  0,  8,  0, 11,  0,  0
```

Starting Vertex: 6

SAMPLE OUTPUT

```
BFS Traversal:
At (6) Vertex ->
------> (2) is a new neighbor
------> (4) is a new neighbor
At (2) Vertex ->
------> (1) is a new neighbor
At (4) Vertex ->
------> (0) is a new neighbor
------> (3) is a new neighbor
------> (4) already known
At (1) Vertex ->
------> (0) already known
At (0) Vertex ->
------> (1) already known
At (3) Vertex ->
------> (1) already known
------> (2) already known

BFS Traversal Order:
6 2 4 1 0 3
```

PseudoCode:

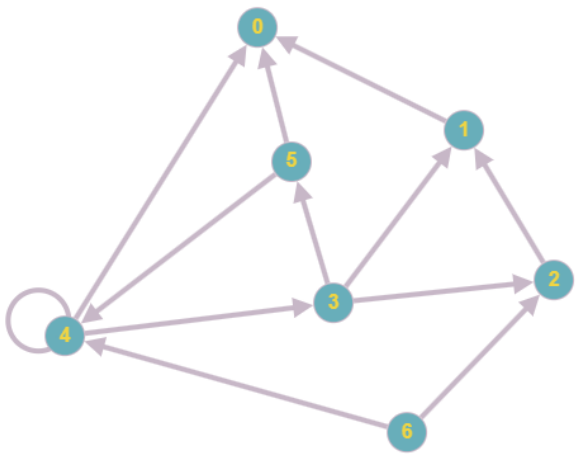
```
Initiate a boolean array of Length V
//the array will keep track of the visited vertices
//initially all values of the array  will be False.
Initiate a Queue
enQueue the starting Vertex

Loop until queue is empty
       current <- deQueue
       visited[ current ] <- true
       Loop through all neighbors of current
              if neighbor is unvisited
                     enQueue each neighbor vertex
                     visited[ neighbor ] <- true
```

Note: The output will change depending on the graph & the starting point.

Task 2:

Implement the DFS algorithm to traverse a Directed Unweighted graph represented by Adjacency Matrix.

SAMPLE GRAPH & Starting Vertex	SAMPLE OUTPUT
 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 1, 1, 0, 0, 1, 0, 1, 0, 0, 1, 1, 0, 0, 1, 0, 0, 0, 1, 0, 0, 0, 0, 1, 0, 1, 0, 0, **Starting Vertex: 6**	DFS Traversal: Visiting (6) Visiting (4) Visiting (3) Visiting (5) Visiting (0) Visiting (2) Visiting (1) DFS Traversal Order: 6 4 3 5 0 2 1

PseudoCode:

```
Initiate a boolean array of Length V
//the array will keep track of the visited vertices
//initially all values of the array  will be False.
Initiate a Stack
push the starting Vertex

Loop till stack is empty
       current <- pop
       if current is unvisited
              visited[ current ] <- true
              Loop through all neighbors of current
                     if neighbor is unvisited
                            then push into stack
```

Note: The output will change depending on the graph & the starting point.

Did you know? You can do DFS without using a Stack. In that case, you'd have to use a programming concept where backtracking exists. Can you guess what that is? **Fun fact:** even that concept utilizes something called Call Stack.