Problem 1:

```
#1. degree of node 1 is 3 and degree of node 4 is  4


#2. shortest path from node 3 to node 4 is [3, 1, 4, 5]


#3. edge list of the graph is [(1, 6), (1, 3), (1, 4), (2, 6), (2, 4), (4, 5), (4, 6)]

#4. adjacency list of graph is
 {1: {6: {'id': 'c'}, 3: {'id': 'a'}, 4: {'id': 'b'}}, 2: {6: {'id': 'e'}, 4: {'id': 'd'}},
3: {1: {'id': 'a'}}, 4: {1: {'id': 'b'}, 2: {'id': 'd'}, 5: {'id': 'f'}, 6: {'id': 'g'}}, 5:
{4: {'id': 'f'}}, 6: {1: {'id': 'c'}, 2: {'id': 'e'}, 4: {'id': 'g'}}}


#5. adjacency matrix of Graph is
[[0. 0. 1. 1. 0. 1.]
[0. 0. 0. 1. 0. 1.]
[1. 0. 0. 0. 0. 0.]
[1. 1. 0. 0. 1. 1.]
[0. 0. 0. 1. 0. 0.]
[1. 1. 0. 1. 0. 0.]]


#6. degree matrix of graph is
[[3 0 0 0 0 0]
[0 2 0 0 0 0]
[0 0 1 0 0 0]
[0 0 0 4 0 0]
[0 0 0 0 1 0]
[0 0 0 0 0 3]]

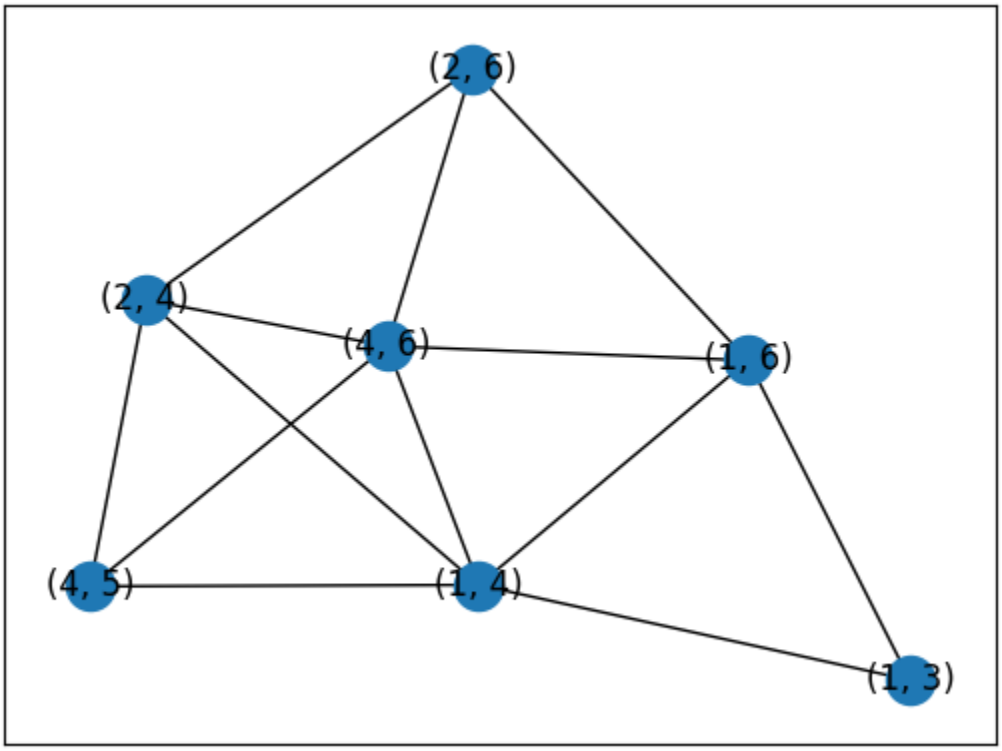

#7. Laplacian matrix of graph is
[[ 3.  0. -1. -1.  0. -1.]
[ 0.  2.  0. -1.  0. -1.]
[-1.  0.  1.  0.  0.  0.]
[-1. -1.  0.  4. -1. -1.]
[ 0.  0.  0. -1.  1.  0.]
[-1. -1.  0. -1.  0.  3.]]

c:\work\pythonML\Assignment 1\question1.py:51: FutureWarning: incidence_matrix will return a
scipy.sparse array instead of a matrix in Networkx 3.0.
  I = nx.incidence_matrix(G).todense();

#8. incidence matrix is
[[1. 1. 1. 0. 0. 0. 0.]
[0. 0. 0. 1. 1. 0. 0.]
[0. 1. 0. 0. 0. 0. 0.]
[0. 0. 1. 0. 1. 1. 1.]
[0. 0. 0. 0. 0. 1. 0.]
[1. 0. 0. 1. 0. 0. 1.]]


#9. difference between output matrix generated from product of incidence matrix and transpos
e of that incidence matrix (C*T(C)) and Degree Matrix (D) is equal to the adjacent matrix (A)
 of that graph
```

#10.



Problem 2

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 #1. in-degrees and out-degrees of node 2 and 6 are  2 ,  1 ,  0 ,  3  respectively


 #2. the shortest path from node 4 to 3 is  [4, 1, 3]


 #3. is this graph strongly connected? : False


#4. largest connected subgraph is {4, 6}


 #5. Is the graph a directed acyclic graph?:  False

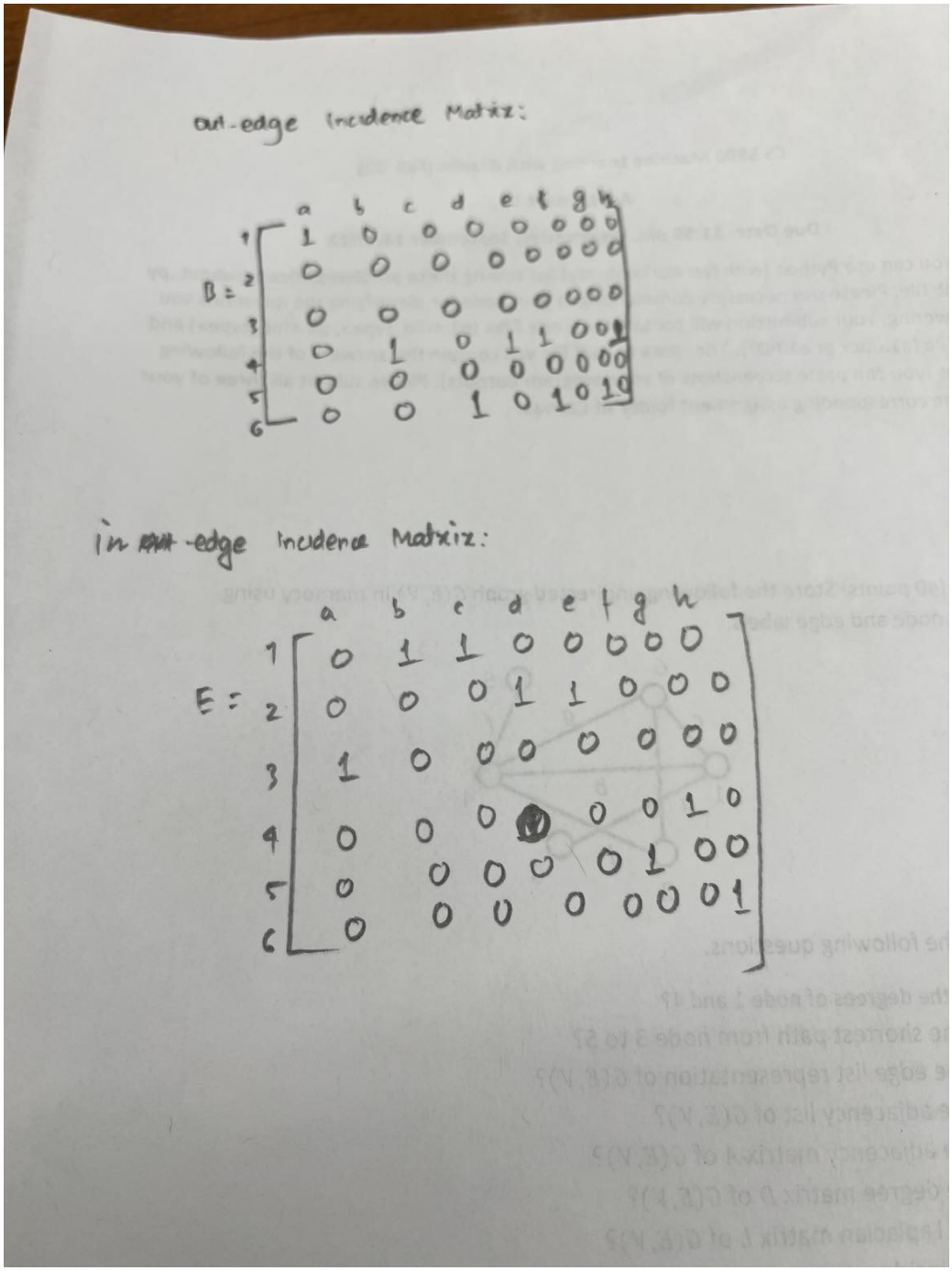

#6. diameter of this graph is -  since this is  not strongly connected directed network and
diameter is infinite because we have nodes which has no path to other nodes ie. infinite diam
eter


#7. edge list of network is  [(1, 3), (4, 1), (4, 2), (4, 5), (4, 6), (6, 1), (6, 2), (6, 4)
]

#8. adjacency list of network is  {1: {3: {}}, 2: {}, 3: {}, 4: {1: {}, 2: {}, 5: {}, 6: {}}
, 5: {}, 6: {1: {}, 2: {}, 4: {}}}


#9. the adjacency matrix of graph is
[[0. 0. 1. 0. 0. 0.]
[0. 0. 0. 0. 0. 0.]
[0. 0. 0. 0. 0. 0.]
[1. 1. 0. 0. 1. 1.]
[0. 0. 0. 0. 0. 0.]
[1. 1. 0. 1. 0. 0.]]
```

10. What are the out-edge incidence matrix B and the in-edge incidence matrix E of G(E,V) ?



```
 #11. product of out edge incidence matrix and transpose of in-edge incidence matrix gives Ad
jacent Matrix


 #13. the adjacency matrix of line graph is
 [[0. 0. 0. 0. 0. 0. 0. 0.]
 [1. 0. 0. 0. 0. 0. 0. 0.]
 [0. 0. 0. 0. 0. 0. 0. 0.]
 [0. 0. 0. 0. 0. 0. 0. 0.]
 [0. 0. 0. 0. 0. 1. 1. 1.]
 [1. 0. 0. 0. 0. 0. 0. 0.]
 [0. 0. 0. 0. 0. 0. 0. 0.]
 [0. 1. 1. 1. 1. 0. 0. 0.]]


 #14. product of transpose of in-edge incidence Matrix(E) and out-edge incidence matrix(E) is
 equal to M
```

 # 12.