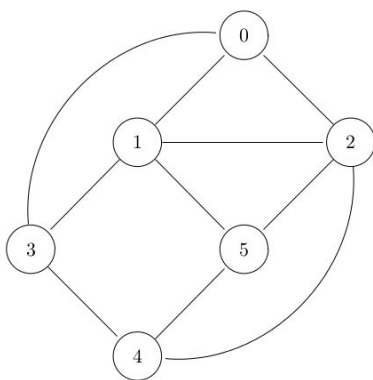# Week 9 - Quiz solution

1. Which sequence corresponds to that of depth first search for the graph given below. The search starts at vertex 0 and lexicographic ordering is assumed for the edges emanating from each vertex.

   A. 0 1 2 4 3 5
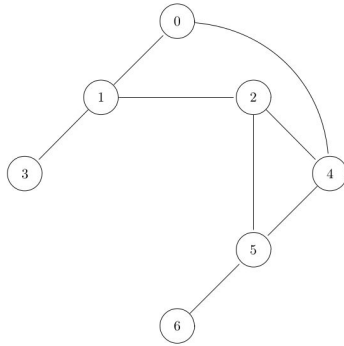
   B. 0 1 2 5 4 3

   C. 0 1 2 3 4 5

   D. 0 1 3 4 2 5

Answer: A. 0 1 2 4 3 5
Explanation:
A correct sequence of DFS traversal is 0 1 2 4 3 5
There is no edge between 2 and 3 and also 5 which is connected to 2 is unvisited.

2. There are 7 systems (0,..,6) connected as given in the figure.

What is the minimum number of connections to be added to the network so that when a system goes down, the rest of the network is still connected ?

    A. 0

    B. 1

    C. 2

    D.   Not possible

Answer: B. 1
Explanation:
Edge (3,6) will make it free from articulate points.
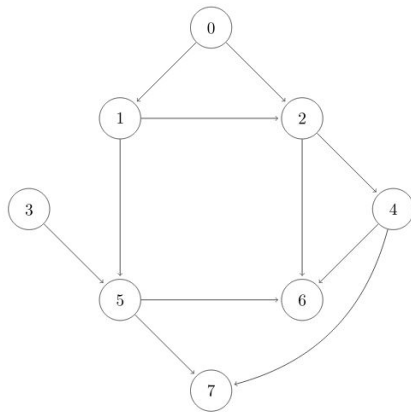
3. The leaf of an expand is never an articulate point

    A. True

    B. False

    C. Cannot be determined

Answer: A. True
Explanation:
If X is an articulation point then there exists a vertex Y which can be only reached by X.
Hence Y would be a descendant of X in the DFT. So X can never be a leaf.

4. Which vertices dominate over vertex 6 in the given graph ?

A. 1,2,4,5

B. 0,1,2,4,7

C. 1,3,4,5,7

D. 0,1,2,3,4,5

Answer: D. 0,1,2,3,4,5

5. Correct choice of data structures can improve the performance of algorithms.

Match the following algorithms with appropriate data structures:

i. Breadth first search		a. Heap
ii. Depth first search		b. Stack
iii. Sorting		c. Queue

A. i-a ii-b iii-c

B. i-b ii-a iii-c

C. i-c ii-b iii-a

D. i-b ii-c iii-a

Answer: C. i-c ii-b iii-a

Explanation:

Among the given choices, queue is the most appropriate for BFS, stack for DFS and heap for sorting.

6. Given a rooted tree, one desires to find the shortest path from the root to a given node **v**. Which algorithm would one use to find this shortest path ?

    A. DFS

    B. BFS

    C. Either BFS or DFS

Answer: C. Either BFS or DFS
Explanation:
A tree has a unique path between any two pairs of nodes.
Any traversal strategy would give us the path (which is the shortest path).

7. Consider an undirected graph G. Let T be a depth first search traversal tree. Let u be a vertex and v be the first unvisited vertex after visiting u. Which of the following statements is always true ?

    A. (u,v) must be an edge in G

    B. (u,v) must be an edge and v is a descendant of u in T

    C. if (u,v) is not an edge, u and v have the same parent.

    D. if (u,v) is not an edge, then u is a leaf.

Answer: D. if (u,v) is not an edge, then u is a leaf.
Explanation:
(u,v) need not necessarily be an edge.
If (u,v) is not an edge, then u has to be a leaf.

8. Consider a graph G. Let T be a BFS tree with root r. Let d(u,v) denote the length of the shortest path between the nodes u and v.

If v is visited before u in the breadth first search traversal, which of the following statements is true ?

    A. d(r,v) > d(r,u)

    B. d(r,v) = d(r,u)

    C. d(r,v) < d(r,u)

    D. insufficient information to comment on d(r,v) and d(r,u)

Answer: D. insufficient information to comment on d(r,v) and d(r,u)
Explanation:
u being traversed after v does not tell us if they are on the same level or not.
The correct relation would be
d(r,v) <= d(r,u)

9. Traversal of a graph is different than tree because.

    A. There can be a loop in the graph

    B. DFS on a graph uses stack, while inorder traversal is recursive

    C. Both A and C

    D. None of the above

Answer: A. There can be a loop in the graph
Explanation:
You need to maintain an array to keep track of the vertices already visited.

10. Is the following statement true.

A DFS of a directed graph always produces the same number of tree edges, i.e. independent of the order in which the vertices are considered for DFS.

    A. Yes
    B. No

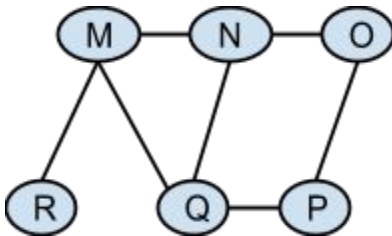11. Consider the following graph.

If we run breadth first search on this graph starting at any vertex, which one of the following is a possible order for visiting the nodes ?
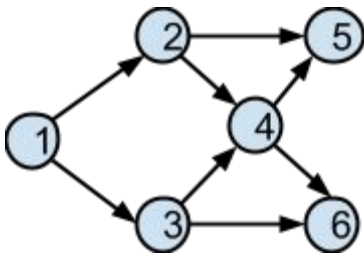
    A. MNOPQR
    B. NQMPOR
    C. QMNPRO
    D. QMNPOR

12. Which of the following is not a topological ordering of the following graph ?

    A. 123456

    B. 132456

    C. 132645

    D. 324165

Answer: D. 324165

Explanation:

3 can not come before 1 and 2