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CSCI 261 Section 2

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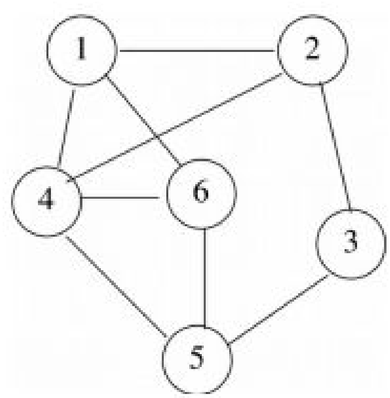
Homework #2

E.1



a) *Draw the adjacency matrix representation for the graph*

	1	***2***	***3***	***4***	***5***	***6***
1	0	1	0	1	0	1
2	1	0	1	1	0	0
3	0	1	0	0	1	0
4	1	1	0	0	1	1
5	0	0	1	1	0	1
6	1	0	0	1	1	0

b) *Draw the adjacency list representation for the graph.*

1	*2*	--	-->	*4*	--	-->	*6*	***X***				
2	*1*	--	-->	*3*	--	-->	*4*	***X***				
3	*2*	--	-->	*5*	***X***							
4	*1*	--	-->	*2*	--	-->	*5*	--	-->	*6*	***X***
5	*3*	--	-->	*4*	--	-->	*6*	***X***				
6	*1*	--	-->	*4*	--	-->	*5*	***X***				

E.2

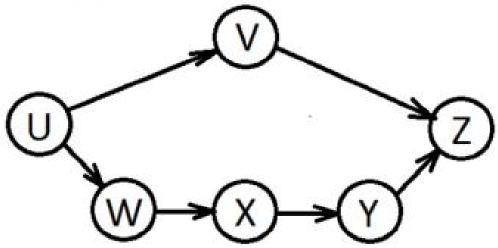
a) *Show the DFS for the graph in Question 1 starting at Node 1. Assume that the lowest unmarked node is always chosen first.*

DFS: 1, 2, 3, 5, 4, 6

b) *Show a BFS for the graph in Question 1, assuming that the lowest number of vertices enter the queue first.*

BFS: 1, 2, 4, 6, 3, 5

E.3



Find all topological orderings for the following graph. Show one ordering per line.

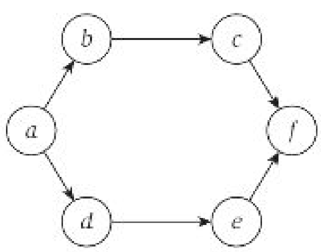
1) U, V, W, X, Y, Z

2) U, W, V, X, Y, Z

3) U, W, X, V, Y, Z

4) U, W, X, Y, V, Z

Text 3.1



Consider the directed acrylic graph above. How many topological orderings does it have?

1) *A, B, C, D, E, F*

2) *A, B, D, C, E, F*

3) *A, B, D, E, C, F*

4) *A, D, B, C, E, F*

5) *A, D, B, E, C, F*

6) *A, D, E, B, C, F*

Text 3.6

We have a connected graph G = (V, E), and a specific vertex u ∈ V. Suppose we compute a depth-first search tree rooted at u and obtain a tree T that includes all nodes of G. Suppose we then compute a breadth-first search tree rooted at u, and obtain the same tree T. Prove that G = T. (In other words, if T is both a depth-first search tree and a breadth-first search tree rooted at u, then G cannot contain any edges that do not belong to T.)

If we say that e = {*a, b*} ∈ G and !∈ T, then

- T is a DFS, which means that one of two ends must be an ancestor of the other.
- T is a BFS, which means the distance of the two nodes from *u* in T can differ by 1.
- Then if we consider the following:
    - If *a* is an ancestor of *b*
    - If the distance from *u* to *b* in T is at most one greater than the distance from *u* to *a*
- **Then** *a* must be the direct parent of *b* in T.
- This means that {*a, b*} ∈ T, which is a contradiction.