- **You must submit your work electronically (via moodle) by 11:59 PM of the due date (see above)**.
- **Write your group's own answer and show all your work**.
- **Every assignment must be typed/generated into a pdf file (convert your file into a pdf format before submission).**
- **Weight: 5%**
- **On your assignment, specify the following at the beginning**.
  Assignment number: 4
  Course number: CSC 220 001
  Term: Winter, 2018
  Instructor name: Dr. Manki Min
  Student names: (names of all the members in your group)

Do the following:

1. Show how the hash table changes as the following words are inserted into a hash table using index = word-to-number % 10, where word-to-number is simply the sum of number of each letter in the word (with A having 1 and Z having 26).
   BAT, CAT, FACE, FAUCET, FAT, BATH, LAST, SHA, EAT, DATA

   (a) In order to deal with the collision, use linear probing.

   (b) In order to deal with the collision, use quadratic probing.

   (c) In order to deal with the collision, use the double hashing with step-size = 10 - (key % 10).

   (d) In order to deal with the collision, use the separate chaining.

2. Convert the following graph notation of adjacency list into a notation of adjacency matrix.

vertex	list
0	$1 \rightarrow 4$
1	$0 \rightarrow 5$
2	$3 \rightarrow 5 \rightarrow 6$
3	$2 \rightarrow 6 \rightarrow 7$
4	0
5	$1 \rightarrow 2 \rightarrow 6$
6	$2 \rightarrow 3 \rightarrow 5 \rightarrow 7$
7	$3 \rightarrow 6$

3. Perform depth-first-search for the same graph as in #2 starting from 0. Show the order of node visitations. Visit the node with the smallest node id first when there are multiple nodes to visit at any moment.

4. Perform breadth-first-search for the same graph as in #2 staring from 0. Show the order of node visitations. Visit the node with the smallest node id first when there are multiple nodes to visit at any moment.

5. Find the MST for the following graph. Show each selection of edges.

	0	1	2	3	4	5	6	7	8
0	0	4	0	0	0	0	0	0	8
1	4	0	8	0	0	0	0	0	11
2	0	8	0	7	0	4	0	2	0
3	0	0	7	0	9	14	0	0	0
4	0	0	0	9	0	10	0	0	0
5	0	0	4	14	10	0	2	0	0
6	0	0	0	0	0	2	0	6	1
7	0	0	2	0	0	0	6	0	7
8	8	11	0	0	0	0	1	7	0

6. Identify one application or situation or program that is best suited for each of the following data structures that we discussed so far. Justify your answer.
Arrays, Linked lists, Balanced binary search trees, Hash tables

1.
BAT = 23
CAT = 24
FACE = 15
FAUCET = 56
FAT = 27
BATH = 31
LAST = 52
SHA = 28
EAT = 26
DATA = 26

a)
0   DATA
1----- BATH
2   LAST
3----- BAT
4   CAT
5----- FACE
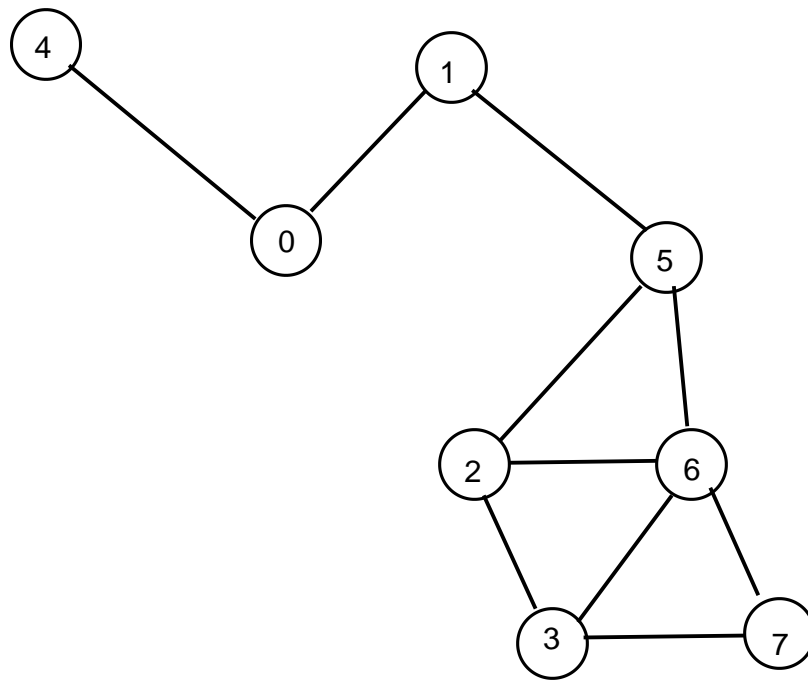6   FAUCET
7----- FAT
8   SHA
9----- EAT

b)
0   DATA
1----- BATH
2   LAST
3----- BAT
4   CAT
5----- FACE
6   FAUCET
7----- FAT
8   SHA
9----- EAT

c)
0   EAT
1----- BATH
2   LAST
3----- BAT
4   CAT
5----- FACE
6   FAUCET
7----- FAT
8   SHA
9-----

d)
0
1----- BATH
2   LAST
3----- BAT
4   CAT
5----- FACE
6   FAUCET, EAT, DATA
7----- FAT
8   SHA
9-----

2.

	0	1	2	3	4	5	6	7
0		1			1			
1	1					1		
2				1		1	1	
3			1				1	1
4	1							
5		1	1				1	
6			1	1		1		1
7				1			1	

3. 0 1 5 2 3 6 7 4

4. 0 1 5 2 6 3 7 4

5.