Gradescope CMPSC-132 Lab #6

Question 1

a) Tree #1 = (3)
Tree #2 = (3)

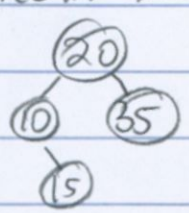
b) Tree #1 = $(2^h - 1) - 4 = (2^3 - 1) - 4 = 7 - 4 = (3)$
Tree #2 = $(2^h - 1) - 6 = (2^3 - 1) - 4 = 7 - 6 = (1)$

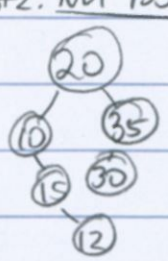
c) Tree #1 = Neither full or complete
Tree #2 = Complete

d) Tree #1:
Pre-Order: 20, 10, 35, 15
In-Order: 10, 20, 35, 15
Post-Order: 10, 15, 35, 20

Tree #2
Pre-Order: 20, 10, 12, 15, 35, 30
In-Order: 12, 10, 15, 20, 35, 30
Post-Order: 12, 15, 10, 30, 35, 20

e) Tree #1: Not BST Tree #2: Not BST

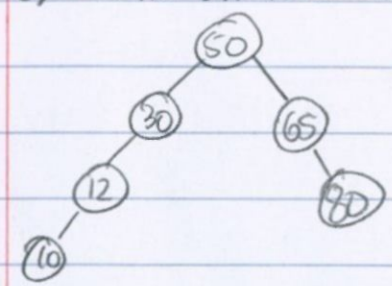




Question 2

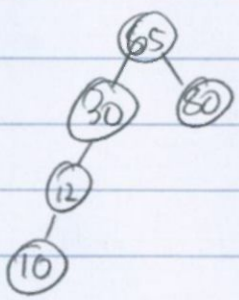
a) It is an AVL Tree since all the heights between the left and right subtrees are at most 1

b) It is not an AVL Tree



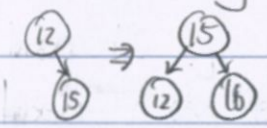
At the node 30, the balance factor is not -1, 0, or 1 meaning it does not satisfy the AVL conditions

c) It is not an AVL Tree At node 30, the balance factor is still 2

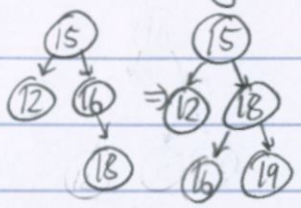


Question 3

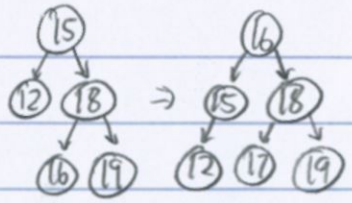
Rotations: Insert 16, single rotate left (Imbalance, 12)



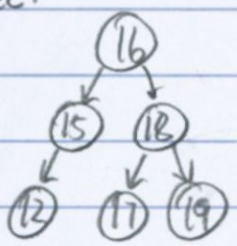
Insert 19, single rotate left (Imbalance 16)



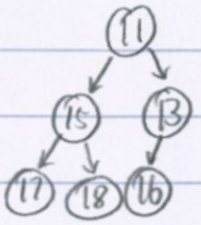
Insert 17, double rotate left (Imbalances, 15, 18)



Final Tree:

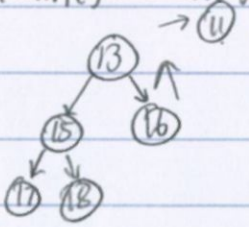


Question 4

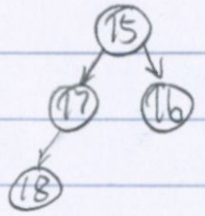


11, 13, 15, 16, 17, 18

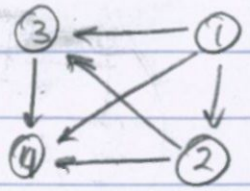
deletMin(): (Removed 11



Final: (Removed 13)



Question 5



a)

	1	2	3	4
1	0	1	1	1
2	0	0	1	1
3	0	0	0	1
4	0	0	0	0

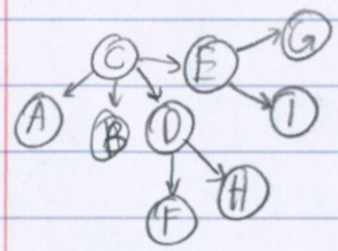
b) (6)

c) (1, 2, 3, 4) = 1 valid result

Question 6

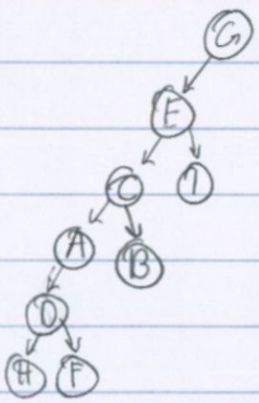
BFS Traversal

C, A, B, D, E, F, G, I, H



DFS Traversal

G, E, C, A, B, D, F, I, H



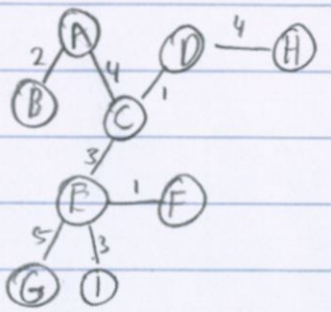
Question 7

Node	Shortest Dist	Prev
A	0	
B	2	A
C	4	A
D	5	C
E	7	C
F	8	E
G	12	E
H	9	D
I	10	E

A → C → E → I

Question 8

Prim's Algorithm

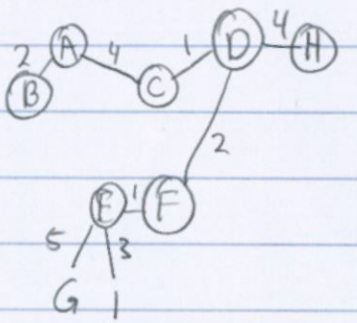


Cost: 23

Order, D, H, C, E, F, I, G, A, B

Kruskal's Algorithm (8-edges)

1 | 1 C↔D
2 | 1 E↔F
3 | 2 A↔B
4 | 2 D↔F
5 | ~~3 C↔E~~ Cycle
6 | 3 E↔I
7 | 4 A↔C
8 | 4 D↔H
9 | ~~5 B↔C~~ Cycle
10 | 5 E↔G
11 | ~~6 A↔D~~ Cycle



Cost: 22

Question 9

a) [_, 36, _, 10, 17, 19, 24]

b) [_, _, 17, 19, _, 36, _, _, 24, 10, _, _, _, _]

c) [_, 36, _, 10, 24, 19, 17] (0.7)