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Part I:

1. (a) ~~#~~

2. (b) ~~#~~

3. (a) ~~#~~

4. (c) ~~#~~

4-2. (b) ~~#~~

Part II:

1. 81, 139, 227, 320, 992, 15, 38, 121, 78, 120

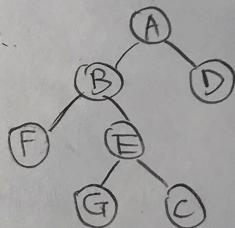
2. a.  $5 \rightarrow 2 \rightarrow 1 \rightarrow 0 \rightarrow 4 \rightarrow 3 \rightarrow 6 \rightarrow 7 \rightarrow 8 \rightarrow 9$

b.  $5 \rightarrow 2 \rightarrow 4 \rightarrow 6 \rightarrow 1 \rightarrow 0 \rightarrow 3 \rightarrow 7 \rightarrow 8 \rightarrow 9$

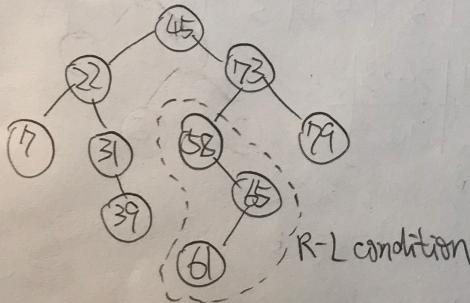
3.

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

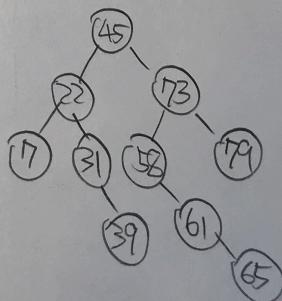
4.



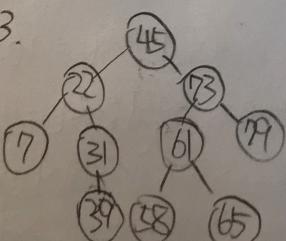
5-a step 1.



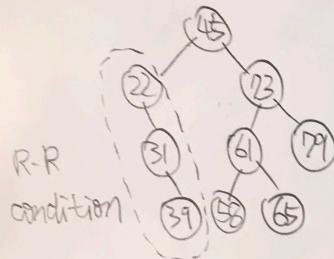
Step 2:



step 3.

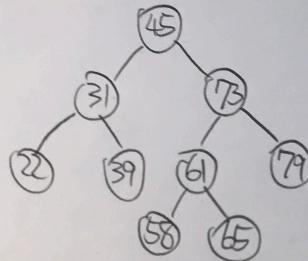


5-b. Step 1.

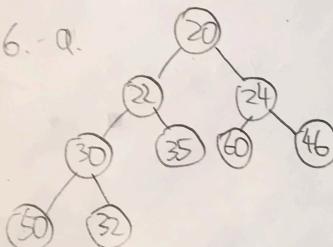


R-R  
condition

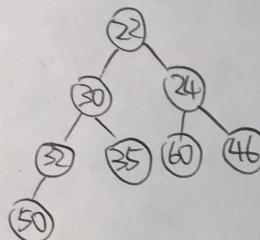
Step 2.



6.-a.



b.



7. Step 1: make set for each node, sort edges in an increasing order of weight.

sets:  $\{0\}$ ,  $\{1\}$ ,  $\{2\}$ ,  $\{3\}$ ,  $\{4\}$ ,  $\{5\}$

edges: vertex  $a \leftrightarrow$  vertex  $b$  |  $1 \leftrightarrow 2$  |  $0 \leftrightarrow 1$  |  $0 \leftrightarrow 2$  |  $3 \leftrightarrow 4$  |  $4 \leftrightarrow 5$  |  $1 \leftrightarrow 5$  |  $0 \leftrightarrow 3$   
weight | 2 | 3 | 4 | 5 | 6 | 7 | 8

|  $2 \leftrightarrow 4$  |  $2 \leftrightarrow 3$  |  
9 | 10 |

Step 2: ① choose  $1 \leftrightarrow 2 \Rightarrow \{1, 2\}$ , total cost = 2

② choose  $0 \leftrightarrow 1 \Rightarrow \{0, 1, 2\}$ , total cost = 5

③ choose  $0 \leftrightarrow 2 \Rightarrow 0, 2$  are in the same set.

④ choose  $3 \leftrightarrow 4 \Rightarrow \{3, 4\}$ , total cost = 10

⑤ choose  $4 \leftrightarrow 5 \Rightarrow \{3, 4, 5\}$ , total cost = 16

⑥ choose  $1 \leftrightarrow 5 \Rightarrow \{0, 1, 2, 3, 4, 5\}$ , total cost = 23

⑦ vertices of rest edges are in the same set.

Result edges:  $1 \leftrightarrow 2$ ,  $0 \leftrightarrow 1$ ,  $3 \leftrightarrow 4$ ,  $4 \leftrightarrow 5$ ,  $1 \leftrightarrow 5$ , total cost = 23

## 8. a. Bellman-Ford Algorithm

b.  $O(VE)$

c.  $O(EL)$

## 9. i. a. Dijkstra's algorithm

As this is a weighted graph, BFS can't support for single source shortest path problem.

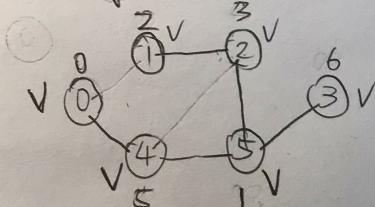
Because time complexity of Bellman-Ford algorithm =  $O(VE)$

Dijkstra's algorithm =  $O(E \log V)$

Dijkstra's algorithm is better than Bellman-Ford algorithm.

b. No, because the minimum spanning tree of a given graph should be unique.

starting vertex = 0



starting vertex = 2

