

HW3

Problem 1 (6 points)

Given input {4371, 1323, 6173, 4199, 4344, 9679, 1989} and a hash function $h(x) = x \bmod 10$ (i.e., the size of the hash table $m = 10$), show the resulting hash tables using

- (1) Separate chaining
- (2) Linear probing with $f(i) = i$
- (3) Quadratic probing with $f(i) = i^2$

①

1)

0	
1	→ 4371
2	
3	→ 1323 → 6173
4	→ 4344
5	
6	
7	
8	
9	→ 4199 → 9679 → 1989

2)

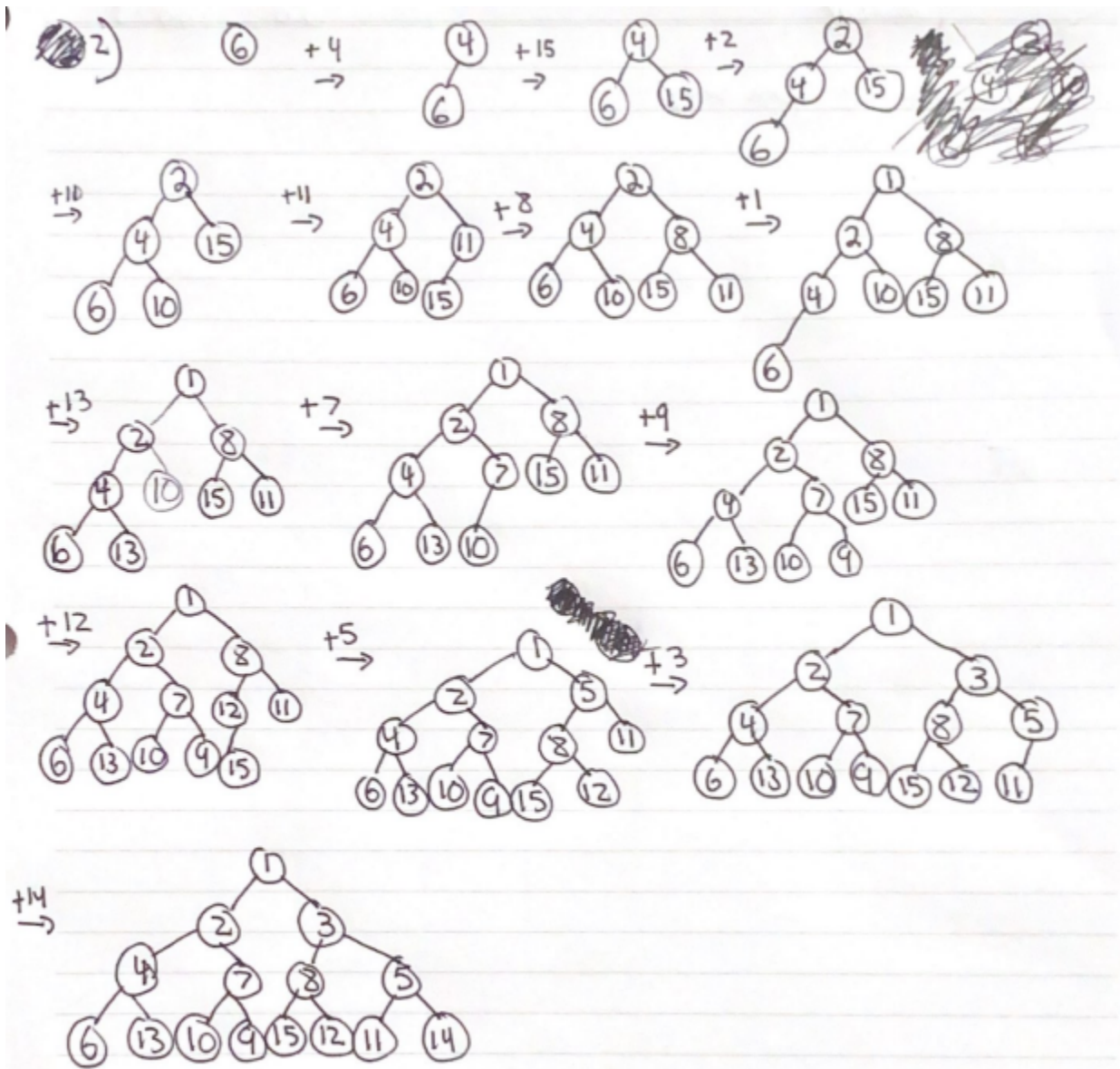
	Empty	After 4371	After 1323	After 6173	After 4199	After 4344	After 9679	After 1989
0								
1		4371	4371	4371	4371	4371	4371	4371
2								1989
3			1323	1323	1323	1323	1323	1323
4				6173	6173	6173	6173	6173
5						4344	4344	4344
6								
7								
8								
9					4199	4199	4199	4199

3)

	Empty	After 4371	After 1323	After 6173	After 4199	After 4344	After 9679	After 1989
0							9679	9679
1		4371	4371	4371	4371	4371	4371	4371
2							9679	9679
3			1323	1323	1323	1323	1323	1323
4				6173	6173	6173	6173	6173
5						4344	4344	4344
6								
7								
8								1989
9					4199	4199	4199	4199

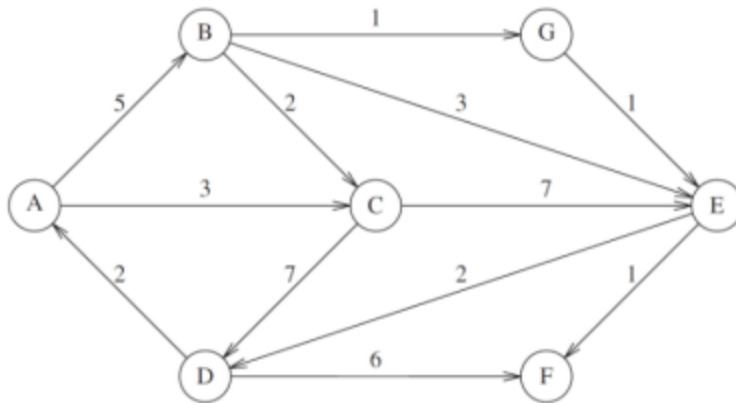
Problem 2 (2 points)

Show the result of inserting values 6, 4, 15, 2, 10, 11, 8, 1, 13, 7, 9, 12, 5, 3, 14 one at a time, into an initially empty binary min-heap.



Problem 3 (12 points)

Using dijkstra's algorithm to find the shortest path from B to all other vertices.



B→A: B→G→E→D→A : 6

B→C: B→C : 2

B→D: B→G→E→D : 4

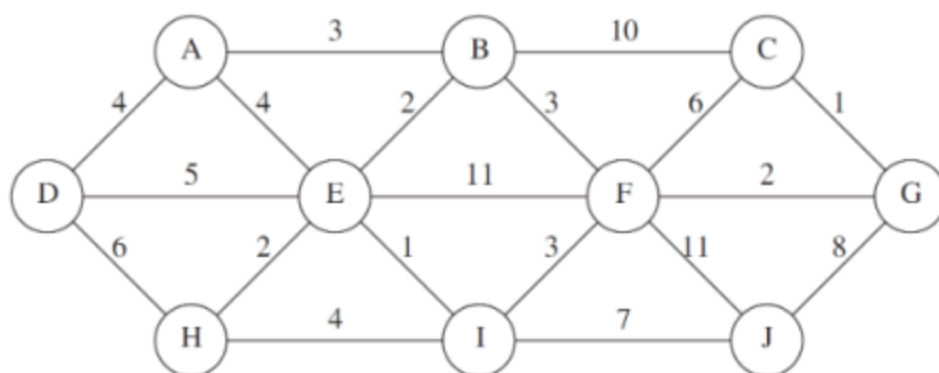
B→E: B→G→E : 2

B→F: B→G→E→F: 3

B→G: B→G: 1

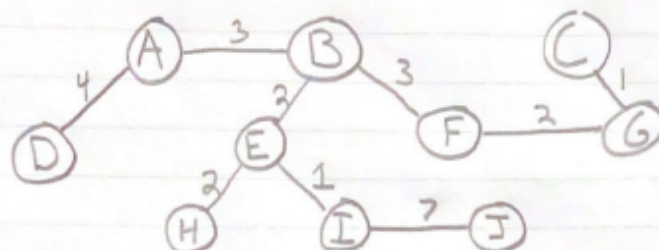
Problem 4 (5 points)

- (1) Find a minimum spanning tree for the graph using Prim's algorithm
- (2) Find a minimum spanning tree for the graph using Kruskal's algorithm
- (3) Is this minimum spanning tree unique?



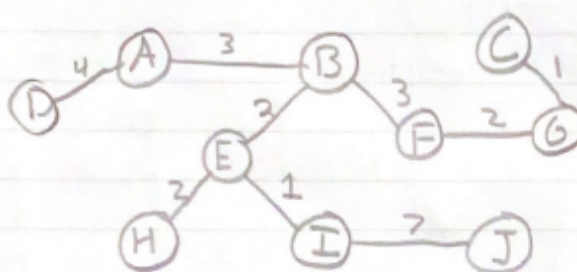
④

1)



Cost = 25

2)



Cost 25

3) tree is not unique, as the edges are not distinct