**Assignment 4**

**Jian Li**

**Problem 1**

**---step 1---**

Dist is

(1: INF) (2: INF) (3 : 0) (4: INF) (5: INF) (6: INF) (7: INF) (8: INF) (9: INF) (10: INF)

Heap is

Node3.dist = 0

Node2.dist = INF

Node1.dist = INF

Node4.dist = INF

Node5.dist = INF

Node6.dist = INF

Node7.dist = INF

Node8.dist = INF

Node9.dist = INF

Node10.dist = INF

**---step 2---**

Dist is

(1: INF) (2: INF) (3 : 0) (4: INF) (5: INF) (6: INF) (7: INF) (8: INF) (9: INF) (10 : 1)

Heap is

Node10.dist = 1

Node2.dist = INF

Node1.dist = INF

Node4.dist = INF

Node5.dist = INF

Node6.dist = INF

Node7.dist = INF

Node8.dist = INF

Node9.dist = INF

**---step 3---**

Dist is

(1: INF) (2: INF) (3 : 0) (4 : 10) (5: INF) (6: INF) (7: INF) (8 : 5) (9: INF) (10 : 1)

Heap is

Node8.dist = 5

Node4.dist = 10

Node6.dist = INF

Node1.dist = INF

Node5.dist = INF

Node9.dist = INF

Node7.dist = INF

Node2.dist = INF

**---step 4---**

Dist is

(1: INF) (2: INF) (3 : 0) (4 : 10) (5: INF) (6 : 8) (7: INF) (8 : 5) (9 : 8) (10 : 1)

Heap is

Node6.dist = 8

Node1.dist = INF

Node9.dist = 8

Node2.dist = INF

Node5.dist = INF

Node4.dist = 10

Node7.dist = INF

**---step 5---**

Dist is

(1: INF) (2: INF) (3 : 0) (4 : 10) (5: INF) (6 : 8) (7 : 10) (8 : 5) (9 : 8) (10 : 1)

Heap is

Node9.dist = 8

Node1.dist = INF

Node4.dist = 10

Node2.dist = INF

Node5.dist = INF

Node7.dist = 10

**---step 6---**

Dist is

(1: INF) (2: INF) (3 : 0) (4 : 10) (5: INF) (6 : 8) (7 : 10) (8 : 5) (9 : 8) (10 : 1)

Heap is

Node4.dist = 10

Node1.dist = INF

Node7.dist = 10

Node2.dist = INF

Node5.dist = INF

**---step 7---**

Dist is

(1: INF) (2 : 17) (3 : 0) (4 : 10) (5: INF) (6 : 8) (7 : 10) (8 : 5) (9 : 8) (10 : 1)

Heap is

Node7.dist = 10

Node2.dist = 17

Node5.dist = INF

Node1.dist = INF

**---step 8---**

Dist is

(1: INF) (2 : 17) (3 : 0) (4 : 10) (5: INF) (6 : 8) (7 : 10) (8 : 5) (9 : 8) (10 : 1)

Heap is

Node2.dist = 17

Node1.dist = INF

Node5.dist = INF

**---step 9---**

Dist is

(1: INF) (2 : 17) (3 : 0) (4 : 10) (5: INF) (6 : 8) (7 : 10) (8 : 5) (9 : 8) (10 : 1)

Heap is

Node1.dist = INF

Node5.dist = INF

**---step 10---**

Dist is

(1: INF) (2 : 17) (3 : 0) (4 : 10) (5: INF) (6 : 8) (7 : 10) (8 : 5) (9 : 8) (10 : 1)

Heap is

Node5.dist = INF

**Problem 2**

---iteration 1:---

Node 1:INF

Node 2:INF

Node 3:0

Node 4:INF

Node 5:INF

Node 6:INF

Node 7:INF

Node 8:INF

Node 9:INF

Node 10:INF

---iteration 2:---

Node 1:INF

Node 2:INF

Node 3:0

Node 4:10

Node 5:11

Node 6:8

Node 7:5

Node 8:8

Node 9:13

Node 10:12

---iteration 3:---

Node 1:INF

Node 2:INF

Node 3:0

Node 4:10

Node 5:11

Node 6:8

Node 7:5

Node 8:8

Node 9:7

Node 10:12

---iteration 4:---

Node 1:INF

Node 2:INF

Node 3:0

Node 4:10

Node 5:11

Node 6:8

Node 7:5

Node 8:8

Node 9:7

Node 10:12

**Problem 3**

**Problem 4**

After topologically sort:

[3, 9, 8, 5, 4, 6, 7, 2, 1, 10]