1. Give the contents of the hash table that results when the keys {E, A, S, Y, W, A, Y} are inserted in order into an initially empty table of size 10. $h_1(k) = k \bmod 10$ for the kth letter of the alphabet. (20%)

   (a) Separate chaining.

   (b) Open addressing using linear probing.

   (c) Open addressing using quadratic probing.

   (d) Open addressing using double hashing, $h_2(k) = 7 - (k \bmod 7)$.

2. Give the contents of the B-tree that results when the keys {14, 54, 12, 65, 45, 87, 57 43, 11, 24, 81, 10} are inserted in that order into an initially empty three, with $M = 3$. (10%)
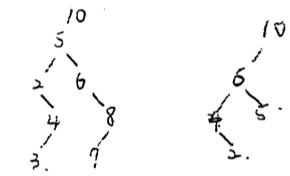
3. For the input {10, 5, 2, 4, 6, 8, 7, 3}. (20%)

   (a) Draw the construction process of a binary heap.

   (b) Show the result of performing three *deleteMin* operations in the heap.

4. Draw the sorting process in increasing order by *heapsort* performed on the heap built in question 2(a). (10%)

5. Find the shortest path of the graph in Figure 1. (20%)

   (a) Apply *DIJKSTRA's* algorithm, starting at *a*.

   (b) Use *WALLSHALL's* algorithm.

6. Find a minimum spanning tree for the graph in Figure 2. (20%)

   (a) Use the *KRUSKAL's* algorithm. Label the edges in alphabetical order. Give the weight of the minimum spanning tree.
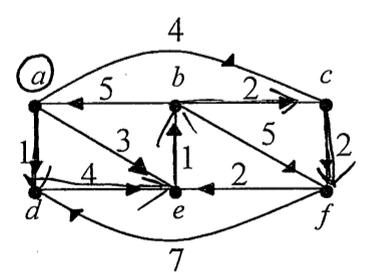
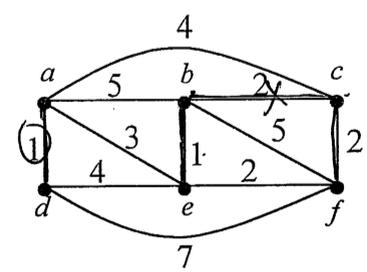   (b) Use *PRIM's* algorithm, starting at vertex *a*.

Figure 1

Figure 2