CS5200: Assignment 5

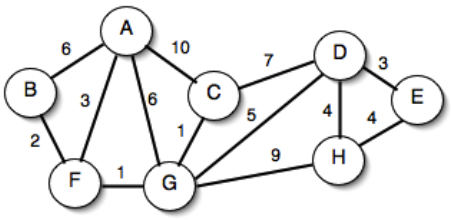
1 Disjoint Sets (6 pts)

1. Assume that UNION(a, b) attaches a to b and the following functions are executed.

```
1  for i = 1 → 8
2        MAKE-SET(x_i)
3  UNION(x_1, x_3)
4  UNION(x_3, x_5)
5  UNION(x_5, x_7)
6  UNION(x_2, x_4)
7  UNION(x_6, x_8)
8  UNION(x_7, x_2)
9  UNION(x_4, x_6)
```

1.1) Show the status of the corresponding data structures using 1) linked-list; 2) disjoint forests with union by size and path compression. (4 pts)
1.2) Show the complexity in number of necessary operations for the two data structures. (2pts)

2 Minimal Spanning Trees (8 pts)



1. Show how Prim's algorithm and Kruskal's algorithm grow the minimum spanning tree for the above graph. (4 pts)
2. Suppose that a graph $G(V, E)$ has a minimum spanning tree already computed. Design an algorithm to update the minimum spanning tree if a new vertex with several incident edges is added to G. (4 pts)