CO-360 Advanced Data Structures
Assignment sheet- 2 Due Date:**3rd April 2018**

Problem Statement: Implement the Prim's algorithms for Minimum Spanning Tree (MST) and compare their performance for various kinds of graphs:

The objective of this assignment is to compare the performance of binary heaps, binomial heap and fibonacci heaps in implementing the minimum spanning tree algorithm

Graph Specification:
The graph to be provided as an input will be subjected to following constraints:
1. It will be a connected graph.
2. It will be a simple graph.
3. It will follow a format as per the below:

The graph is given as a text file to the program. The format of the text file should be as follows:
1) First node id's will be given on every line. Each line will have only one id.
2) The end of node id's will be marked by a line containing #.
3) Next, each line sholud specify an edge as follows:
id1<space>id2 <space><weight>

The graphs which will be given as input to the Prim's Algorithm will be generated randomly within the system itself.

For Random Graph Generation some parameters will be needed which will indicate the complexity, size etc. of the graph.
Parameters:
1. Number of vertices in the graph
2. Density of the graph (can be specified in terms of number of edges required)
Using the above parameters edges can be chosen at random between any two vertices and added to the graph structure.
3.Range of (integer) weights to be randomly generated for the directed arcs Choose an appropriate data structure for the graph.

What is to be done ?

Implement the Prim's algorithms for Minimum Spanning Tree (MST), using binary heaps , using binomial heaps and using fibonacci heaps. Make sure to use the standard array data structure for binary heaps and an efficient, appropriate data structure for binomial heaps and Fibonacci heaps. Attempt to do it in C++ but C is also good enough. As usual, special care should be taken to structure your program according to best practices in software engineering: use of good abstractions, smart algorithms, discipline in coding, documentation, provision for exceptions (for example, errors in input should be flagged asap; etc.).

For the input graph print the following:

- Minimum spanning graph and its cost.
- Execution times of the program with binary heaps, binomial heaps and fibonacci heaps

Note: Make groups of 3 students in each team. Each member implement the different heaps for the Prim's Algorithm.