Lab Assignment 9 (14 Dec 2020)

Problem 1 : a) Implement the Disjoint-Set Union Data Structure (with the union-by-rank and path-compression heuristics). Create a class for the Data Structure and implement the three operations i.e. **makeset**, **findset** and **union** as three class methods. You will need a distinct Node class with three fields: value, rank and parent.

b) "Suppose that we wish to add the operation **printset(x)**, which is given a node x and prints all the members of x's set, in any order. Show how we can add just a single attribute to each node in a disjoint-set forest so that **printset(x)** takes *time linear in the number of members of x's set*, and the asymptotic running times of the other operations are unchanged. Assume that we can print each member of the set in O(1) time."

Problem 2: Implement the algorithm for computing the connected components of a graph using the Disjoint Set data structure implemented above.

Problem 3: Implement Kruskal's MST algorithm on an undirected graph. Use the data structure your have implemented in problem 1 in your code here. Use modules to import your code. For e.g. for Python, you can refer to **https://www.programiz.com/python-programming/modules** or **https://docs.python.org/2/tutorial/modules.html** on how to build/import modules.