Assignment 4

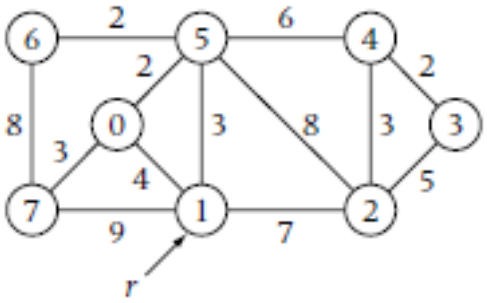
Design & Analysis of Algorithms (4071) Spring 2018

*Due **Wednesday, April 4** at the beginning of the class*

Reminder: ***Test 2*** *will be held during class on* ***Wednesday, April 11***

*Each group will submit one copy (**including a cover sheet with group number, and a list of members of group**) at the beginning of class on the due date. Keep a scanned copy for your record.*

1. [15pts] Page 281, Exercise 6.5
2. [15pts] Page 282, Exercise 6.9.
3. [10pts] Page 282, Exercise 6.10.
4. Consider the following weighted graph *G*.



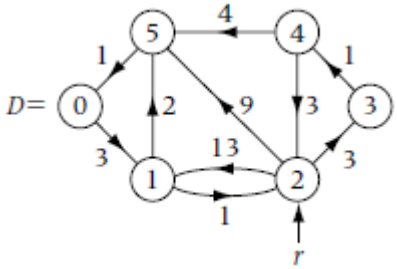
For part a) illustrate the action of union and find for the collection of disjoints sets corresponding to the nodes in trees of the forest being grown as well as the forest itself. An example will be done in class. For part b) illustrate the action of Prim's algorithm using Figure 6.11 on Page 272 as a model.

a) [10pts] Trace the action of procedure *Kruskal* for *G*.

b) [10pts] Trace the action of procedure *Prim* for *G*, with $r = 1$.

5. For parts a) and b) illustrate the action of Dijkstra's algorithm using Figure 6.13 on Page 279 as a model.

a) [10pts] Trace the action of procedure Dijkstra for the following digraph with initial vertex $r = 2$.



b) [10pts] repeat for $r = 3$.

6. [10pts] Page 329, Exercise 7.13.

More challenging question (hint will be given in class)

7. [10pts] Design a greedy algorithm to solve the *optimal merge pattern* problem. In this problem, we have n sorted files of lengths $f_0, f_1, \ldots, f_{n-1}$, and we wish to merge them into a single file by a sequence of merges of pairs of files. To merge two files of lengths m_1 and m_2 takes $m_1 + m_2$ operations. Describe your algorithm in general, and illustrate it for files of lengths 10,7,3,5,9,2,3,2. (Can you make a connection with Huffman codes and Exercise 1 of this assignment?)