

Homework #5
Introduction to Algorithms/Algorithms 1
600.363/463

Due on: Friday, May 4th, 11:59 a.m. (NOON)

Where to submit: On blackboard, under student assessment

Late submissions: will NOT be accepted

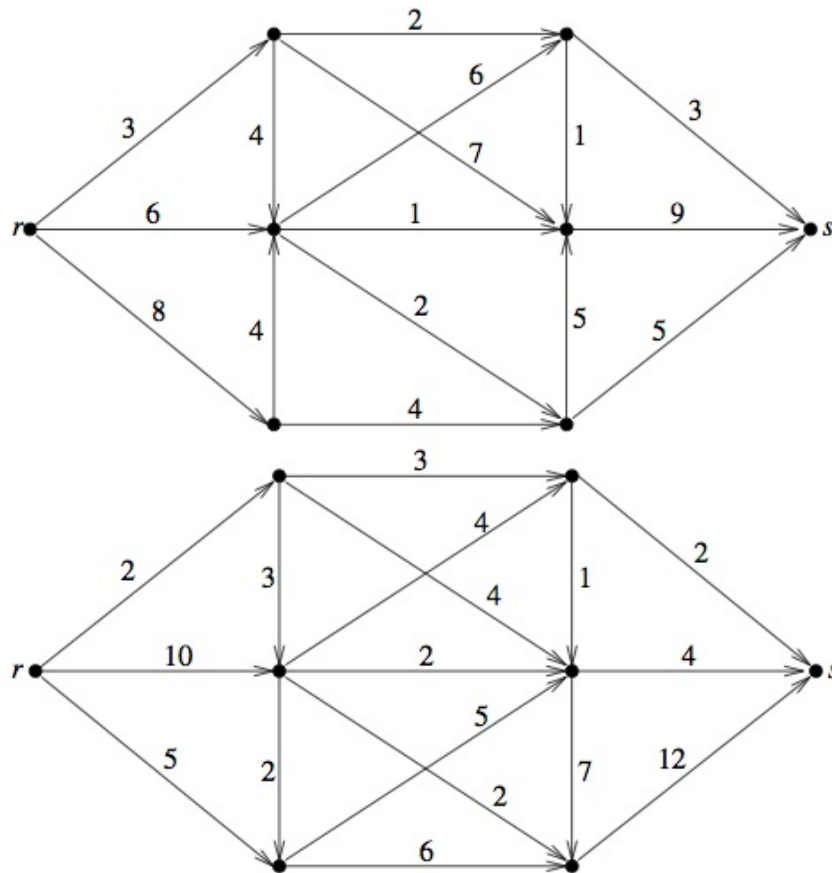
Format: Please start each problem on a new page.
Please type your answers.

April 22, 2012

Problem 1

Prove that if all the edge capacities are rational, then the Ford-Fulkerson algorithm eventually terminates.

1 Problem 2



Find the maximum flow in the graphs above. Note that r is the source and s is the sink.

2 Problem 3

Draw or describe a red-black tree that contains the following keys (the order between keys is alphabetical, i.e. $A < B$ and so on)

J
H
U

I
S
G
R
E
A
T

3 Problem 4

Consider a sequence of n characters $X = \{x_1, x_2, \dots, x_n\}$. Define $X[i, j] = \{x_i, x_{i+1}, \dots, x_j\}$. We say that $X[i, j]$ is a palindrome if for all $0 \leq k \leq j - i$ we have $x_{i+k} = x_{j-k}$.

For example, if $X = \text{aaaaaaaaaajddlkdjldslkjjj}$ then $X[1, 12] = \text{aaaaaaaaaaaa}$ is the longest palindrom subsequence of X . Design a dynamic programming algorithm that determines the length of a longest palindrome subsequence of X in quadratic time.