

Assignment 7

due Wednesday, June 5, 2019

- no late assignments accepted after 2pm, Friday, June 7
- only problems 1 and 2 will be graded

1. You are running a software company and have a series of n jobs that must be pre-processed first on a supercomputer before being moved to a smaller PC. You have only one super-computer, but you have n PCs so the second stage can be performed in parallel. More specifically, your jobs are described as $J_1 = (s_1, f_1), J_2 = (s_2, f_2), \dots, J_n = (s_n, f_n)$, where job J_i needs s_i units of time to be pre-processed on the super-computer and f_i units of time on the PC.

You need to work out an order in which to give the jobs to the super-computer. As soon as the first job is done on the super-computer, it can be moved to the PC for finishing; at that point a second job can be given to the super-computer; when the second job is done it can go straight to a PC since the PCs can work in parallel, and so on. So if the jobs are processed in the order given, job J_i finishes at time $(\sum_{k=1}^i s_k) + f_i$.

A schedule is an ordering of the jobs to be given to the super-computer. The completion time is the point at which *all* jobs have finished being processed on the PCs. We wish to minimize the completion time.

- (a) Give an efficient (greedy!) algorithm for computing the optimal order in which to process the jobs so that the completion time is minimized.
- (b) Describe the greedy choice your algorithm makes and show that it is correct.

[10 points]

2. exercise 5.18, part (a), left column only (DPV). That is, consider the left column of the table for problem 5.18, characters *blank*, *e*, *t*, *a*, *o*, *i*, *n*, *s*, *h* with the given frequencies. Show the Huffman encoding of these characters. **[5 points]**
3. illustrate the Ford-Fulkerson algorithm on the graph of figure 1 **[unassessed]**

Total: 15 points

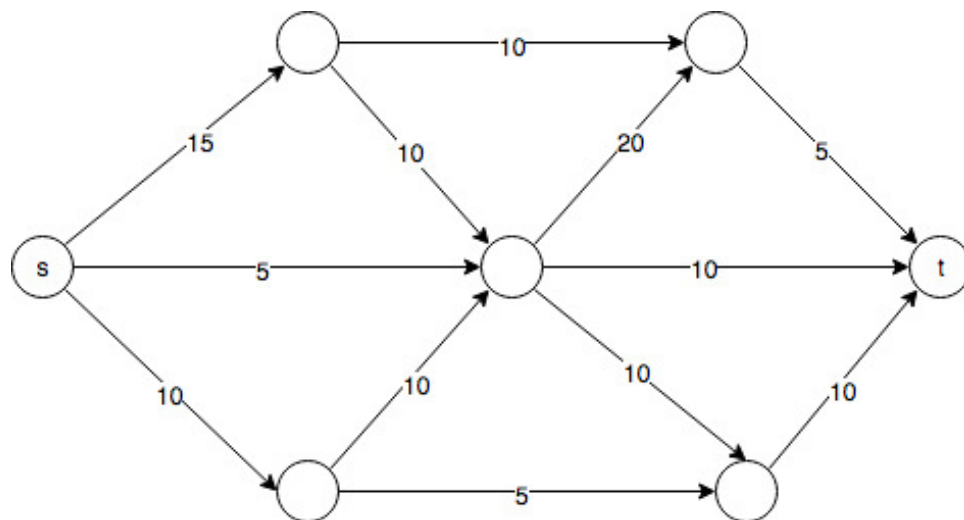


Figure 1: Flow graph with capacities