Due: Friday, November 4, beginning of lecture
Note change of due date by one day.

NOTE: Each problem set only counts 5% of your mark, but it is important to do your own work (but see below). Similar questions will appear on the first term test which will cover material relating to both assignment 1 and assignment 2. You may consult with others concerning the general approach for solving problems on assignments, but you must write up all solutions entirely on your own. the University's Code of Behavior. You will receive 1/5 points for any question/subquestion for which you say "I do not know how to answer this question". You will receive .5/5 points if you just leave the question blank.

1. (Excerise 2 on pages 313,314 of text)
   (a) As stated in the text, give an input instance where the algorithm does not produce an optimal solution. [5 points]
   (b) Describe an appropriate semantic array OPT for computing the value of an optimal solution and then provide a computationally defined array $\overline{OPT}$ for computing OPT. Finally, indicate how you would compute an optimal solution and not just the value of an optimal solution. [10 points]
2. Use dynamic programming to solve Exercise 16 on page 327. [10 points]
3. Suppose we are given a flow network $\mathcal{F}$ with edge capacities $\{c_e | e \in E\}$ and we are also given a max flow f in $\mathcal{F}$.
   (a) Suppose we increase the capacity of each edge $e \in E$ by one unit to form a new flow network $\mathcal{F}'$. That is, let $c'(e) = c(e) + 1$ for all $e \in E$. Let f' be a max flow in $\mathcal{F}'$. Prove or disprove:
      i. $val(f') > val(f)$.
      ii. $val(f') = val(f) + 1$. [10 points]
   (b) Let $\tilde{e}$ be a specific edge in E and form a new flow network $\mathcal{F}'$ by increasing the capacity of $\tilde{e}$ by one unit leaving all other edge capacities unchanged. That is, $c'(\tilde{e}) = c(\tilde{e}) + 1$ and $c'(e) = c(e)$ for all $e \neq \tilde{e}$. Show how to compute a max flow f' in $\mathcal{F}'$ in time $O(m)$ where m is the number of edges. [10 points]