CSE 207: Sample Questions on Greedy Algorithms
February 2011 Semester

These are only question ideas and do not guarantee exam questions.

1 Ch 16: Greedy Algorithms

1.1 Activity Selection

1. What are an open set and a half open set?
2. What are the main steps of a greedy algorithm?
3. Define *activity selection problem*
4. It is true that the activity selection problem has one unique optimal solution?
5. Consider the following two greedy choice for activityselectiob problem:
   (a) Always take the activity that has earliest starting time
   (b) Always take the activity that has smallest length
6. Are the above two greedy choice optimal? If "yes", then prove; oterwise give counter example for each of them showing that they are not optimal.
7. Consider the following greedy choice for activity selection problem: Always take the activity that has earliest finish time. Prove that this greedy choice leads to an optimal solution.
8. What is an optimal greedy choice for activity selection?
9. Prove the "optimal substructure property" for activity selection problem.
10. Prove that the greedy choice for activity selection problem leads to an optimal solution.

1.2 Huffman Coding

1. Why binary coding is used in text file compression?
2. Which one is a greedy choice, explain: (1) using binary coding for file compression, (2) using prefix coding for file compression, (3) using Huffman coding for computing a prefix coding?
3. How can you explain that a binary coding is represented by a binary tree?
4. Prove that a binary coding that is *not* represented by a full binary tree can not be optimal.
5. What is the greedy choice in Huffman's algorithm for computing a prefix code.
6. Is it true that a prefix code is always optimal?
7. Is it true that a prefix code can always be represented by a full binary tree?
8. Prove that in Huffman coding, two least frequency characters are siblinks.

9. Is it true that in Huffman coding, two least frequency characters have maximum depth? Explain. Try some examples.
10. What is the formula for computing the total size of a compressed file by binary coding? Explain.
11. Write pseudo code for Huffman coding. What data structure would you use to implement this coding?
12. Prove that the greedy choice in Huffman coding is optimal (Lemma 16.2).
13. Prove that the problem of constructing optimal prefix coding by Huffman's algorithm follows the optiamal substructure property (Lemma 16.3).
14. Exercise 16.3.1-16.3.4, 16.3.7, 16.3.8

1.3 Elements of Greedy Algorithms

1. What are the main steps in greedy algorithm?
2. How do you compare DP with greedy? What are their similarities, and what are the differences? (See supplementary notes in the web.)
3. What are the *0-1 knapsack* and *fractional knapsack* problem? How do you explain whether DP or greedy would be applicable for computing the optimal solutions for these two problems and the other algorithm would fail.
4. Show that the *shortest path* in an undirected graph has optimal substructure property. (See Section 15.3)
5. Show that the *longest path without cycle* in an undirected graph does not have optimal substructure property. (See Section 15.3)