

EECS 336: Design and Analysis of Algorithms Weekly Problem Set #3

Class Homepage: www.cs.northwestern.edu/~kao/eecs336-algorithms/index.htm

Posted on the Class Homepage: Tuesday, October 14, 2014.

Due Time: the start of class on Tuesday, October 21, 2014.

Policy for This Problem Set: Different problem sets may have different policies. This problem set is to be done by one student singly. To answer the questions in this problem set, you may consult your textbook, your lecture notes, the Internet, and any materials that you can find in libraries. You may also discuss solution ideas for these questions with the instructor or the teaching associates, but no one else. You may not copy answers from other people, including those from your fellow students or those posted on the Internet. If you copy all or portions of your answers from other people, you will receive 0 point for the entire problem set. If two students have identical or essentially identical answers but the original sources of the answers cannot be determined, both students will receive 0 point for the entire problem set.

Questions: There are 3 questions.

- (35 points) This question is similar to Exercise 15.5-2 on page 404. Compute an optimal binary search tree for the following probability distribution. Show the steps of your computation.

i	0	1	2	3	4	5	6	7
p_i		0.14	0.02	0.12	0.04	0.06	0.08	0.10
q_i	0.04	0.08	0.09	0.03	0.04	0.06	0.01	0.09

- (35 points) Exercise 16.3-7 on page 436. Change ternary codewords to 5-ary codewords (i.e., codewords using the symbols 0, 1, 2, ..., 4). Prove the correctness of your algorithm, and analyze the time complexity and space complexity of your algorithm.
- (30 points) This question builds upon Problem 23-1 on page 638. Assume that no two spanning trees have the same total weight. For this question, give a polynomial-time polynomial-space algorithm to compute the third-best spanning tree of G . Prove the correctness of your algorithm and analyze the time complexity and space complexity of your algorithm.