EECS 336: Design and Analysis of Algorithms
Weekly Problem Set #5

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

Posted on the Class Homepage: Tuesday, October 28, 2014.

Due Time: the start of class on Tuesday, November 4, 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 4 questions. Each question is worth 25 points.

1. Exercise 17.4-3 on page 471. Modify this exercise as follows. Instead of contracting a table by halving it size when its load factor drops below 1/4, we contract it by multiplying its size by 1/16 when its load factor drops below 1/32. The policy for expanding a table remains unchanged. Show that the amortized costs of both Table-Delete and Table-Insert are bounded above by constants.

   Note that you may need to come up with a new potential function to make your amortized analysis work.

2. Problem 17-2 on page 473. Modify this problem as follows. Assume that there is no deletion. Consider a new operation called batch-insert. A batch-insert inserts n new elements at the same time where n is the number of elements already in the data structure before the batch-insert and also the new elements are given in increasing order before the batch-insert.

   Answer parts a and b. Also, discuss how to perform batch-insert and analyze its worst-case and amortized times.

3. Exercise 34.1-3 on page 1060.

4. Exercise 34.1-4 on page 1060.