EECS2011ON: Fundamentals of Data Structures
Assignment 3
Due: 9 pm, Tuesday, March 17, 2020

- **This course has zero tolerance on <u>plagiarism</u>. This is an individual assignment; you may not share solutions with other students or obtain them from other individuals or agencies.**
- **The course website clearly states the <u>Copyright Law Notice</u> on several of its pages.**
- **Read the course FAQ on how to submit assignments and the marking scheme.**
- **Print your name, EECS account and student ID number on top of <u>EVERY</u> file you submit.**

Further Instructions:
- This assignment consists of 3 problems on lists, trees, and priority queues.
- Submit your solutions in a file named **a3sol.pdf**.
- Express each of your algorithms in pseudo-code with detailed explanation of how it works, its correctness, and its time analysis. To eliminate any possible ambiguity, you may optionally submit the source code in a separate .java file too.
- You will be graded on correctness, efficiency, clarity, testing, and good use of OOP principles where applicable.

Problem 1: [30%]   Card Shuffle   ([GTG] Exercise C-7.44, page 303):

Assume the input list is a singly linked list. Your algorithm has to perform the shuffle

in-place, i.e., it is allowed to use only O(1) additional memory cells. So, you are not allowed

to use any additional (or duplicate) list of any kind that may use more than O(1) cells.

Problem 2: [30%]   Binary Tree Node Balance Factors   ([GTG] Exercise C-8.44, page 353):

You should also carefully analyze the time complexity of your algorithm.

Problem 3: [40%]   Priority Search Tree   ([GTG] Exercise P-9.56, page 400):

Make sure you clearly justify why your algorithm works correctly and takes linear time.