CSCI 335 **Spring 2020**

HW 3 Q2: Hashing and Heaps

(15 points deliverable)

April 2, 2020

This is an individual assignment

Instructions for Q2:

1. **This assignment has two questions, one programming assignment and the other writing assignment. This document describes only the written assignment worth 15/100 points. The programming assignment is worth 85/100 points and is described in S20-Assignment3-Q1.pdf.**
2. **There will be two gradescope submissions open. One for Q1 and the other for Q2.**
3. **Academic Integrity policy will be strictly enforced.**

Learning Outcome: The goal of this assignment is hashing and heaps. It includes testing three hashing implementations. You will also use your best hashing implementation for a simple spell-checker. Acknowledge the sources you use in the README file

Q2: Heaps Total: 15 points

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HW 3 Written Assignment :

Q2 Deliverable:

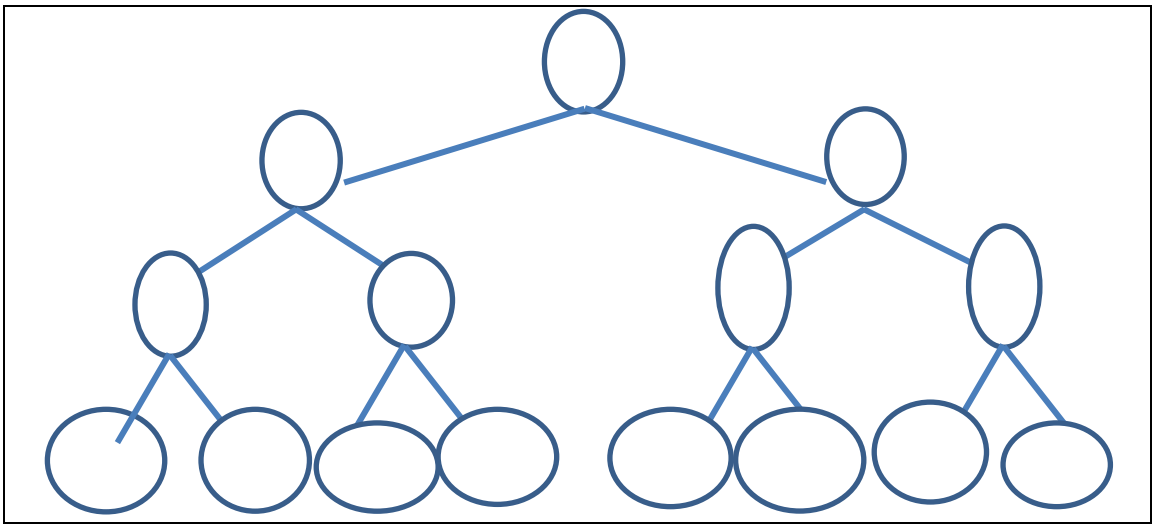
For this question, please fill in your answers electronically in the word document using the space provided, save as pdf with the same file name and submit in the respective Gradescope submission.

a. A complete binary tree of N elements uses array positions 1 to N. Suppose we try to use an array representation of a binary tree that is not complete. Determine how large the array (in terms of N, last 3 answers are in terms of big-Oh) must be for the following (fill in the answers in the right column below) (5 points)

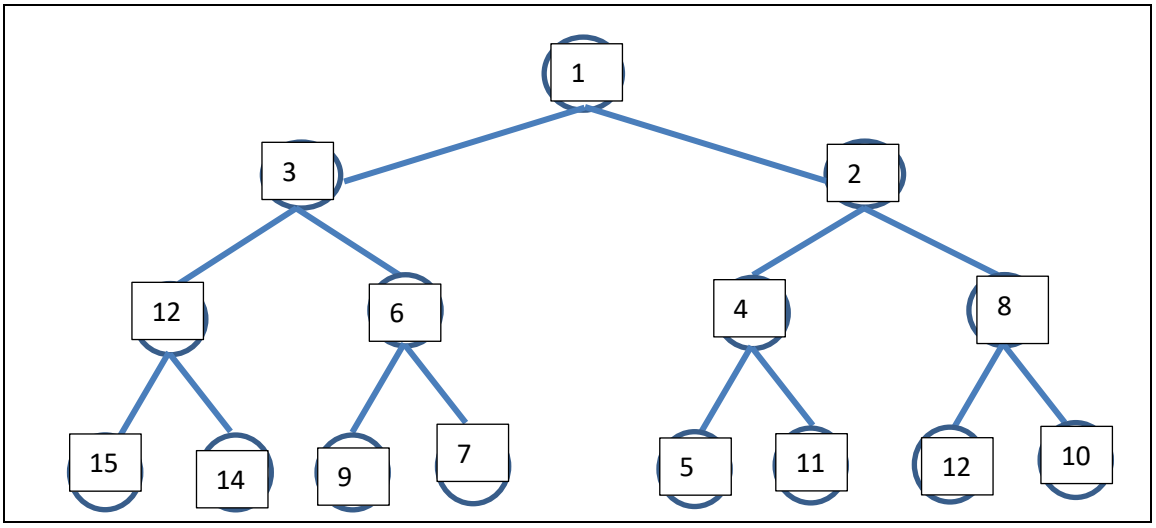
A binary tree that has two extra levels (that is, it is slightly unbalanced)	2^{logN+2}

A binary tree that has a deepest node at depth 2logN	2^{2logN}
A binary tree that has a deepest node at depth 4.1 log N	$2^{4.1logN}$
The worst-case binary tree	2^{N}

b. Show the result of inserting 10, 12, 1, 14, 6, 5, 8, 15, 3, 9, 7, 4, 11, 12 and 2 one at a time, into an initially empty binary heap. Fill in the structure below with the final answer. (5 points)



c. Show the result of using the linear-time algorithm to build a binary heap using the same input in Q2.b. Fill in the structure below with the final answer. (5 points)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