Seoul National University

M1522.000900 Data Structure

Fall 2017, Kang

Homework 4: Binary Trees (Chapter 5)

Due: October 26, 02:00 PM

## Reminders

- The points of this homework add up to 100.
- Like all homeworks, this has to be done individually.
- Lead T.A.:Beunguk Ahn (beunguk.ahn@gmail.com)
- Please type your answers in English. Illegible handwriting may get no points, at the discretion of the graders.
- If you have a question about assignments, please upload your question in eTL.
- If you want to use slipdays or consider late submission with penalties, please note that you are allowed one week to submit your assignment after the due date.

Remember that:

1. Whenever you are making an assumption, please state it clearly

## Question 1

(a) Show the BST that results from inserting the values 15, 12, 25, 18, 16, 5, and 7 (in that order). [10points]

(b) Show the enumerations for the tree of (a) that result from doing a preorder traversal, an inorder traversal, and a postorder traversal. [15points]

A. Preorder

B. Inorder

C. Postorder

## Question 2

Suppose that we have BSTs which have integers as node values, and we want to search for the number 365. Answer whether the following sequences could be or could not be the sequence of nodes examined. (You do not need to provide the reason for invalid sequences.) [20points]

a. 2, 252, 401, 398, 330, 344, 397, 365.

b. 924, 220, 911, 244, 898, 258, 362, 365.

c. 925, 202, 911, 240, 912, 245, 365.

d. 2, 399, 387, 219, 266, 382, 381, 278, 365.

e. 935, 278, 347, 621, 299, 392, 358, 365.

## Question 3

(a) Show the max-heap($H_a$) that results from running *buildheap* talked in the lecture on the following values stored in an array. [10points]

10 5 12 3 2 1 8 7 9 4

(b) Show the heap($H_b$) that results from deleting the maximum value from the $H_a$. [10points]

(c) Show the heap($H_c$) that results from deleting the maximum value from the $H_b$. [10points].

## Question 4

(a) Build the Huffman coding tree and determine the codes for the following set of letters and weights. [10points]

| Letter | Q | Z | F | M | T | S | O | E |
|---|---|---|---|---|---|---|---|---|
| Frequency | 2 | 3 | 10 | 10 | 10 | 15 | 20 | 30 |

(b) What is the average number of bits required by a character using the Huffman code? [15points]