



EASTERN UNIVERSITY, SRILANKA
SECOND EXAMINATION IN SCIENCE – FIRST SEMESTER (2007/2008)
(December/ January 2008)

CS 201 – DATA STRUCTURE AND DESIGN OF ALGORITHMS
(Proper and Repeat)

Answer all questions

Time allowed: 2 Hours

Q1)

- a. Give example algorithms or code segments for each of the following complexities:
 - i. $O(1)$;
 - ii. $O(n)$;
 - iii. $O(n^2)$.
- b. What is the benefit of using linked list over an array based lists?
- c. Describe the basic stack operations.
- d.
 - i. Calculate the value of the following postfix expression:

2 4 3 5 + * 4 / 6 - ^

- ii. The above postfix expression in part d(i) is evaluated using a static array based stack. Show the content of the stack at each step of the evaluation.

Q2)

- a. Explain the insertion sort algorithm.
- b. Apply the above algorithm to the following data set, showing the intermediate result.
10, 20, 6, 5, 8, 18, 16, 34, 61, 9
- c. For the same algorithm of part (a),
 - i. derive the expressions for the number of comparison as a function of the data set size 'N', for the worst, average and best case scenarios.
 - ii. derive the expression for the number of swaps as a function of the data set size 'N', for the worst, average and best case scenarios.
 - iii. what is the worst case computational complexity of the above algorithm?

Q3)

- a. Briefly define the following:
 - i. Binary tree;
 - ii. Depth of a tree;
 - iii. Almost complete binary tree.
- b. How deletion of an element is done in a Binary Search Tree? Give your answer for all possible scenarios.

c. A Binary Search Tree is constructed by entering the following data set:

7	15	6	4	13	2	3	20	19	17
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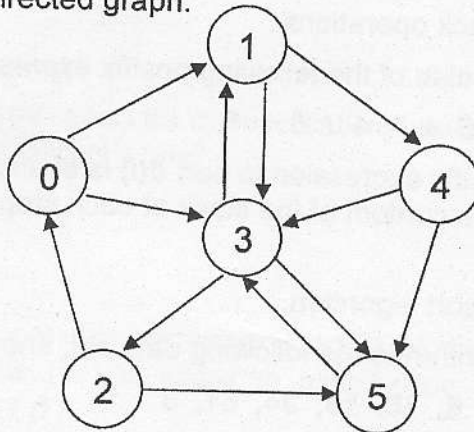
- i. Draw the binary search tree after entering all the data elements.
- ii. Give the order in which the nodes of the above tree will be visited in Pre-order, In-order and Post-order traversals.
- iii. Draw the two possible binary search trees after deleting the element '7'.

Q4)

a. Briefly define the following:

- i. Directed graph;
- ii. Weighted graph;
- iii. Path of a graph.

b. The following is a directed graph.



- i. Explain the "Adjacency Matrix" and "Adjacency List" representation of a graph, giving the advantages and disadvantages.
- ii. Represent the above directed graph using the methods in the part b(i).
- iii. Give the order in which the vertices of the above graph will be visited starting from the vertex '0' in;
 - i. breadth first traversal (BFT);
 - ii. depth first traversal (DFT).