EASTERN UNIVERSITY, SRI LANKA

DEPARTMENT OF MATHEMATICS

EXTERNAL DEGREE EXAMINATION IN SCIENCE

SECOND YEAR EXAMINATION IN SCIENCE (2008/2009)

FIRST SEMESTER (Dec/Jan, 2012/2013)

EXTCS 201 – DATA STRUCTURES AND DESIGN OF ALGORITHMS

Answer all questions — Time: Two hours

Q1)

1. State clearly what an algorithm is.
2. List down five characteristics of algorithm.
3. Linear List is one of the data structure.
   Write algorithms for the following Linear List operations which:
   a. Insert an element in to last of the Linear List;
   b. Remove an element from a Linear List.
4. Let L= (E, X, T, C, S, D, P, Q) be a Linear List. E, X, T, C, S, D, P, Q are characters
   What is the result of each of the following operations?
   a) L.isEmpty()
   b) L.size()
   c) L.get(4)
   d) L.indexOf(0)
   e) L.add(6,T)
   f) L.remove(2)

Q2)

1. State the main difference between Stack and Queue data structures.
2. Write codes for the following Queue operations which:
   a. Check whether Queue is empty;
   b. Return front element of the Queue;
   c. Add an element to the Queue;
   d. Remove an element from a Queue.
3. Write an algorithm that determines whether or not an input string is a **palindrome**, that is, whether **or** not it can be read the same forward and backward. At each point, you can read only one character of the input string. You can use **Stack and Queue** Operations to solve this problem.
   For example,
   Input Strings: "MADAM" is a palindrome;
   "AMMA" is a palindrome;
   "NANPAN" is **not a** palindrome.

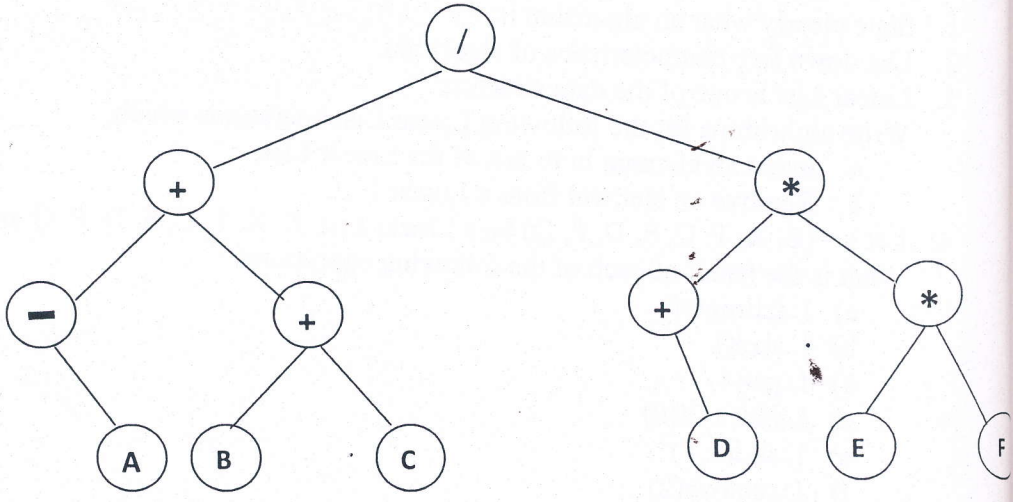
Q3)

A. Briefly describe the **binary tree**.

B. The following figure is shown a binary tree.

Write algorithm for each of the following traversals to visit each node in the tree:

1. Pre-Order;
2. In-Order;
3. Post-Order.



C. Let T be a binary tree of 11 nodes that are labeled A to K in some order and suppose **in-order** traversal and **pre-order** traversal visit the nodes in the order

E, I, A, F, B, K, C, G, D, J, H and

K, I, E, F, A, B, J, G, C, D, H respectively

i. Construct the binary tree.

ii. In what order will the post-order traversal visit the nodes?

Q4)

a) Describe **bubble sort** in your words how it works and write an algorithm for it?

b) Sort the following numbers into ascending order using Bubble sort.

[65 , 10 , 23 , 42 , 8 , 20 , 1]

(You should write each step)

c) Write the **Breadth First Search algorithm (BFS).**

d) By using BFS traversal algorithm, write down the traversal order of the graph from the node **P**.

(Draw the graph for each step).