EASTERN UNIVERSITY, SRI LANKA
DEPARTMENT OF MATHEMATICS

FIRST EXAMINATION IN SCIENCE (2008/2009)
FIRST SEMESTER (Oct/Nov,2014)

EXTCS 201-DATA STRUCTURE AND DESIGN OF ALGORITHMS
(Repeat)

ANSWER ALL QUESTIONS

TIME: TWO HOURS

1)

   a. Define in your own words what a "data structure" is.

   b. Briefly describe the following terms :
   - I. Big-O-notation;
   - II. Primitive Data Type;
   - III. Singly Linked list.

   c. Change the following infix notations to postfix and prefix:
   - I. $a^2+2ab-c$;
   - II. $[(a+b)(a-b)/c]-d$;
   - III. $[a+(b/c)]/[c-(a+b)]$.

   d. Evaluate the following expressions:
   - I. $* - / + 2\ 3\ 2\ 2\ \%\ 6\ 4$;
   - II. $18\ 6\ -\ 7\ 5\ -\ -\ 4\ +\ 2\ \%$.

   e. Write a recursive function for the following :
   - I. To find the nth Factorial ;
   - II. To find the nth power of a given positive integer x.

2)

a. Define "Over Flow" and "Under Flow" conditions of stack.

b. Write algorithms for the following:

       I.   To check whether a stack is empty ;

      II.   To push an element into the Stack;

     III.   To pop an element from the Stack;

     IV.   To check whether a queue is full;

      V.   To insert an element into the Queue (Enqueue) ;

     VI.   To delete an element from the Queue (Dequeue).

c. Write an algorithm to check "Palindrome" using "Stack".

d. Briefly explain the advantage of "Circular Queue" compare to "linear Queue".

e. Write an algorithm to evaluate "Prefix expressions".

3)

a. Write the definition for the following :

      I.   Binary tree ;

      II.   Strictly binary tree ;

     III.   Complete binary tree .

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

      I.   Pre-Order;

      II.   Post-Order;

     III.   In-order.

c. Write the **pre-order, post-order, in-order and level order** traversals for the following tree
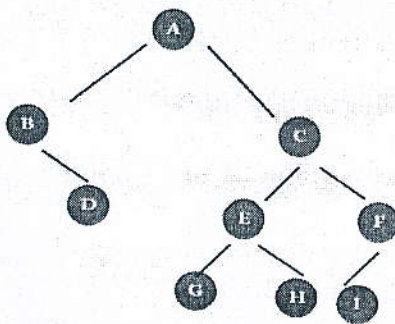
d. If number of leafs of a complete binary tree is n and depth is d. Find the number of nodes in the tree.

e. Evaluate the following tree using pre order traversal.
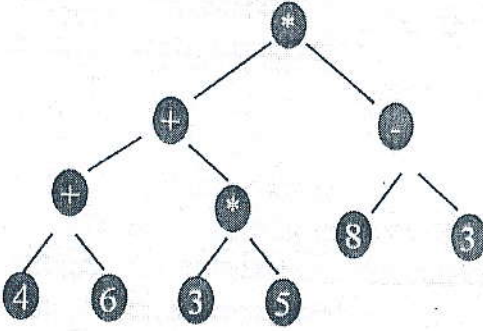
a. Write the definition for the following:
   I.   Complete graph ;
   II. Un-directed graph ;
   III. Weighted graph ;
   IV. Adjacency matrix of a graph.

b. Give the Adjacency matrix for the following graph :
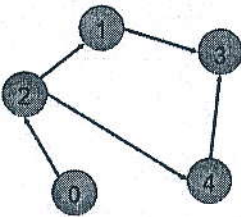
c. Find the shortest distance of the nodes B, C, D and E from the source node A using "Dijkstra's Algorithm":