BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI
HYDERABAD
CAMPUS,
Data Structures and Algorithms
CS F211 / IS F211
Homework Assignment – 11

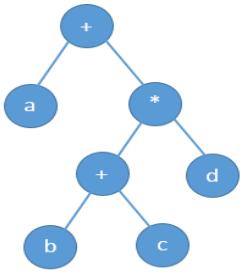
1. You are given an algebraic expression in the form of infix expression. Lowercase letters a, b, c, … z represent your operands. Your job is to evaluate the given expression by taking inputs from the user for the operands present in the expression. Expression may contain parenthesis to avoid confusion. There are some steps followed to evaluate the value of infix expression. First step is to convert infix expression to post-fix expression and then evaluate the post-fix expression.

   Example:
   Input:
   Enter the infix expression for evaluation: a+b*c-d
   Enter the values of operands a,b,c,d: 4 5 3 2
   Output:
   The result of the given expression is: 17
   Input1:
   Enter the infix expression for evaluation: (a+b)*(c-d)
   Enter the values of operands a,b,c,d: 4 5 3 2
   Output1:
   The result of the given expression is: 9

2. You are given an algebraic expression representing some math arithmetic example ((a+b)*c). Along with algebraic expression you are also given the binary operator precedence order from highest to lowest () , ^, /, *, - , + . Lowercase letters a, b,c, … z represent your operands. Your job is to convert such expressions to prefix form. The prefix form of the above example is *+abc.

   Example:
   Input:
   Enter the infix expression for prefix conversion:
   (a+b-c)*d-(e+f)
   Output: The prefix equivalent of the infix expression -> (a+b-c)*d-(e+f) is: -*-+abcd+ef

3. Expression tree is a binary tree in which each internal node corresponds to operator and each leaf node corresponds to operand. For example expression tree for a + ((b+c)*d) would be:

   Write a menu drive C program that supports the following operations.
   a. Creating an expression tree (user input will be an expression as above)

b. Print the postfix of the given expression (i.e., expression given in option a)
c. Print the prefix of the given expression (i.e., expression given in option a)
d. Exit

4. Given a binary search tree BST, write a menu drive C program to find the maximum and minimum key values stored in BST. You need to implement the following operations.
   a. Create a BST by taking inputs from the user
   b. Find the maximum key of the BST
   c. Find the minimum key of the BST
   d. Find Successor of a inputted key
   e. Find Predecessor of inputted key
   f. Exit

5. Write a Menu driven program which will help you to create a BST and then delete a key from BST. Following option you will use :
   a. Insert a key into the tree (helps to create tree)
   b. Count total nodes in the tree
   c. Count total leaves in the tree.
   d. Find height of the tree.
   e. Exit

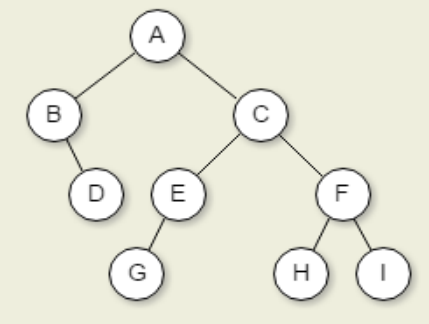
6. Write a Menu driven program which will help you to create a BST and then delete a key from BST. Following option you will use :
   a. Insert a key into the tree (helps to create tree)
   b. Delete a key from the tree
   c. Exit

7. Write a C program that has a function SmallerThanEqual(K) which outputs, in ascending order of keys, all elements in a binary search tree (BST) whose keys are smaller than or equal to K.

   Note : You are required to create the tree. At time of evaluation we will give you keys of tree.

8. You are given in-order and post-order of a tree in form of character arrays. Using these two, you need to construct the tree from it. After constructing the tree print the pre-order of the tree.
   Ex :
   In-order : BDAGECHFI
   Post-order : DBGEHIFCA

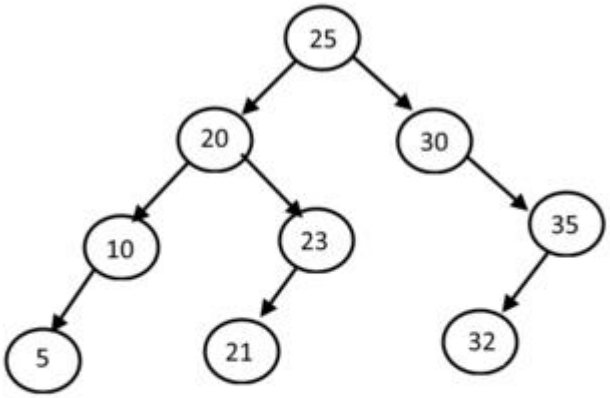
   For this constructed tree is :



   Pre-order : ABDCEGFHI

9. You are given pre-order of BST(binary search tree) in from int array representing the keys(data). Construct tree from it and print it's in-order and post-order traversal.

10. Finding common ancestor is an interesting game and you like to play it. Suppose the people are enumerated by numbers and their ancestor chain is represented by a binary search tree. You are given two numbers as input. Using the BST, find the lowest common ancestor of the two numbers. The inputted number will definitely belong to tree.
    Example :



Lowest Ancestor Ancestor (5, 21) = 20
Lowest Ancestor Ancestor (10, 30) = 25
Lowest Ancestor Ancestor (5, 32) = 25
Lowest Ancestor Ancestor (10, 23) = 20

Note : You are required to create the tree. At time of evaluation we will give you keys of tree.

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