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FALL Semester 2022-23

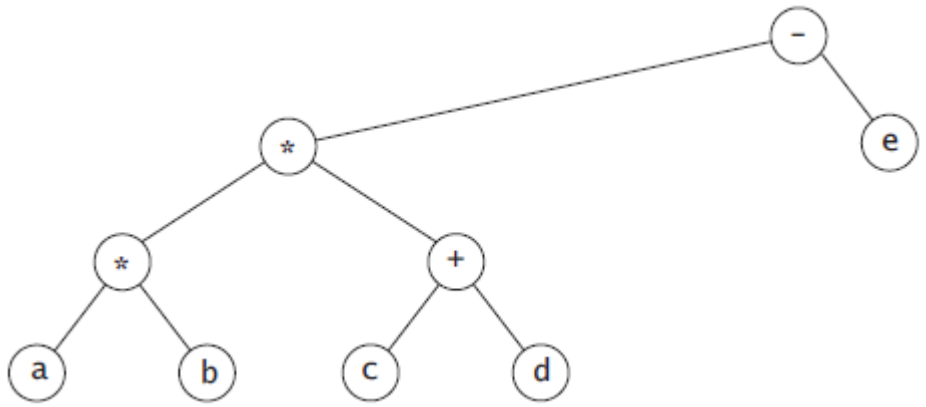
ITA5002 - Problem Solving with Data Structures and Algorithms

ASSESSMENT – I

Due Date: 20-10-2022

SOLVE ANY FIVE PROBLEMS GIVEN BELOW

1. Write an algorithm to convert an infix expression into postfix and prefix expressions using stack. Convert the following expression using the stack
   a. A ^ B * C – D + E / F / (G + H)
   b. A – B / (C * D ^ E)
2. Write an algorithm to add two polynomials represented as circular list with header node.
3. Give the prefix, infix and postfix expressions corresponding to the tree given below.



4. Create a program that provides a binary converter by using stack. Use stack to store the remainder. The program would get as input a decimal number and would output the binary equivalent. Hint: examine what happens when we continually divide the number by 2.

5. Consider the following algorithm.

```
ALGORITHM Binary(n)
//Input: A positive decimal integer n
//Output: The number of binary digits in n's binary representation
count ←1
while n > 1 do
        count ←count + 1
        n←[n/2]
return count
```

   i. What does this algorithm compute?

   ii. What is its basic operation?

   iii. How many times is the basic operation executed?

   iv. What is the efficiency class of this algorithm?

   v. Suggest an improvement, or a better algorithm altogether, and indicate its efficiency class. If you cannot do it, try to prove that, in fact, it cannot be done.

6. Select and apply an appropriate data structures to store data in each of the following cases.

   a. A list of employee records needs to be stored in a manner that it is easy to find max or min in the list

   b. A library needs to maintain books by their ISBN number. Only thing important is finding them as soon as possible.

   c. A data set needs to be maintained in order to find the median of the set quickly.