

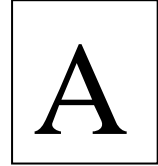
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SNS College of Technology, Coimbatore-35.
(Autonomous)

B.E/B.Tech- Internal Assessment -III
Academic Year 2023-2024(EVEN)
Second Semester (R2023)



23ITT101 – PROGRAMMING IN C AND DATA STRUCTURES
[Common to Aero, Agri, Auto, Civil, FT, MCT, Mech]

Time: 1^{1/2} Hours

Maximum Marks: 50

Answer Key

PART-A (5 x 2 = 10 Marks)

1. What are the various Operations performed on the Stack? CO4 Und
The various operations that are performed on the stack are
 - CREATE(S) – Creates S as an empty stack.
 - PUSH(S,X) – Adds the element X to the top of the stack.
 - POP(S) – Deletes the top most elements from the stack.
 - TOP(S) – returns the value of top element from the stack.
 - ISEMTPTY(S) – returns true if Stack is empty else false.
 - ISFULL(S) - returns true if Stack is full else false
2. Convert the infix expression $(a+b)*(c+d)/f$ into postfix expression. CO4 App
Postfix : $a b + c d + * f /$
3. What do you mean by non-linear data structure? Give example. CO4 Und
The non-linear data structure is the kind of data structure in which the data may be arranged in hierarchical fashion. For example- Trees and graphs
4. List out the types of binary tree and define complete binary tree. CO5 Rem
 - Full Binary Tree (Proper Binary Tree)
 - Complete Binary Tree
 - Perfect Binary Tree
 - Balanced Binary Tree
 - Degenerate (or pathological) Tree

A **complete binary tree** is defined as a binary tree in which every level, except possibly the last, is completely filled, and all nodes are as far left as possible.

5. Differentiate binary tree and binary search Tree.

CO5 Ana

- **Node Value Ordering:** Binary trees have no specific ordering of node values, whereas BSTs enforce a specific ordering (left < current < right).
- **Purpose:** Binary trees are used for hierarchical data storage, while BSTs are optimized for efficient searching and retrieval.
- **Structure Emphasis:** Binary trees focus on hierarchical organization, while BSTs emphasize both structure and value ordering.
- **Insertion and Search Efficiency:** BSTs offer faster insertion, deletion, and searching operations due to their ordered structure compared to binary trees.
- **Flexibility:** Binary trees are more flexible in terms of the values stored in nodes, while BSTs impose a strict order on node values to maintain efficiency.

PART-B (13+13+14=40 Marks)

6. a) Assume a Book Arrangement in a table Identify the policy and mention the operation used to take books. Implement the above using C program

13 CO4 Ana

```
void push (int val, int n) //n is size of the stack
{
    if (top == n )
        printf("\n Overflow");
    else
    {
        top = top +1;
        stack[top] = val;
    }
}
int pop ()
{
    if(top == -1)
    {
        printf("Underflow");
        return 0;
    }
    else
    {
        return stack[top - - ];
    }
}
```

(Or)

```
void insert(struct node * ptr, int item) {
ptr = (struct node * ) malloc(sizeof(struct node));
if (ptr == NULL) {
printf("\nOVERFLOW\n");
return;
} else {
ptr -> data = item;
if (front == NULL) {
front = ptr;
rear = ptr;
front -> next = NULL;
rear -> next = NULL;
} else {
rear -> next = ptr;
rear = ptr;
rear -> next = NULL;
}
}
}

void deleteNode(struct node * ptr) { printf("Underflow");
return;
} else {
ptr = front;
front = front -> next;
free(ptr);
}}
```

1. Root

In a tree data structure, the first node is called as Root Node. Every tree must have a root node. We can say that the root node is the origin of the tree data structure. In any tree, there must be only one root node. We never have multiple root nodes in a tree.

2. Edge

In a tree data structure, the connecting link between any two nodes is called as EDGE. In a tree with 'N' number of nodes there will be a maximum of 'N-1' number of edges

3. Parent

In a tree data structure, the node which is a predecessor of any node is called as PARENT NODE. In simple words, the node which has a branch from it to any other node is called a parent node. Parent node can also be defined as "The node which has child / children".

4. Child

In a tree data structure, the node which is descendant of any node is called as CHILD Node. In simple words, the node which has a link from its parent node is called as child node. In a tree, any parent node can have any number of child nodes. In a tree, all the nodes except root are child nodes.

5. Leaf

In a tree data structure, the node which does not have a child is called as LEAF Node. In simple words, a leaf is a node with no child. In a tree data structure, the leaf nodes are also called as External Nodes. External node is also a node with no child. In a tree, leaf node is also called as 'Terminal' node.

6. Degree

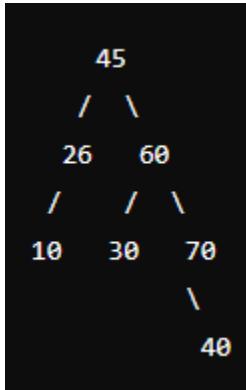
In a tree data structure, the total number of children of a node is called as DEGREE of that Node. In simple words, the Degree of a node is total number of children it has. The highest degree of a node among all the nodes in a tree is called as 'Degree of Tree'

(or)

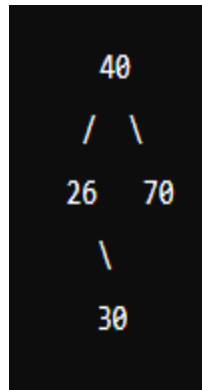
b) Create a binary search tree for the following numbers start from an empty binary search tree. 45,26,10,60,70,30,40 Delete keys 10,60 and 45

13 CO5 App

Insertion:



Deletion:



8.

a) Construct an algorithm for Conversion of Infix to Postfix using Stack and Convert $a*b^c-(d^e*f^g)+h$ to postfix expression

14 CO4 App

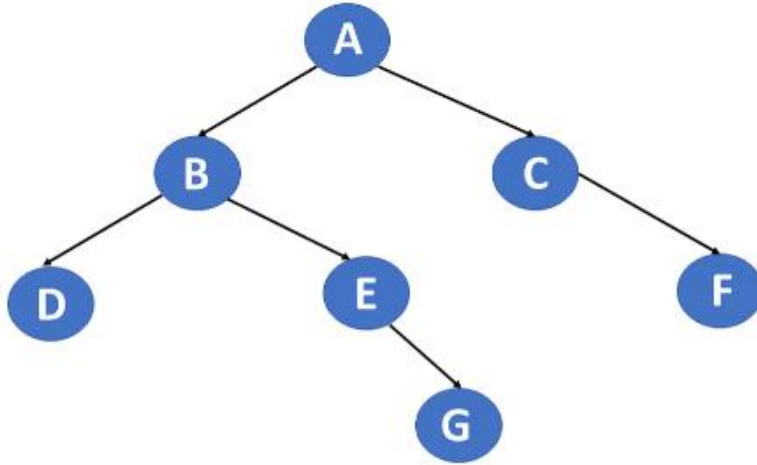
- Scan all the symbols one by one from left to right in the given Infix Expression.
- If the reading symbol is an operand, then immediately append it to the Postfix Expression.
- If the reading symbol is left parenthesis '(', then Push it onto the Stack.
- If the reading symbol is right parenthesis ')', then Pop all the contents of the stack until the respective left parenthesis is popped and append each popped symbol to Postfix Expression.
- If the reading symbol is an operator (+, -, *, /), then Push it onto the Stack. However, first, pop the operators which are already on the stack that have higher or equal precedence than the current operator and append them to the postfix. If an open parenthesis is there on top of the Stack then push the operator into the stack.

If the input is over, pop all the remaining symbols from the stack and append them to the postfix. $abc^*de^fg^*-h+$

(or)

(b) Illustrate for the below tree inorder, preorder and postorder form with an algorithm.

14 CO5 APP



Inorder: DBEGACF

Preorder: ABDEGCF

Postorder: DGEBFCA

Note: (Und-Understand Rem-Remember Ana-Analyze App-Apply)

Prepared by

Verified by

HoD