



SNS COLLEGE OF TECHNOLOGY

Coimbatore-35

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COURSE NAME : 23ITT201 DATA STRUCTURES

II YEAR/ III SEMESTER

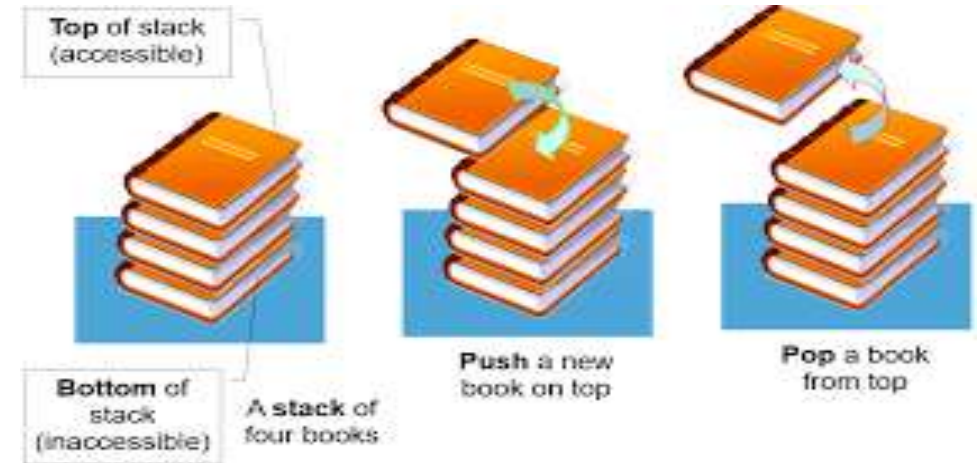
UNIT – II STACKS AND QUEUES

Topic: Linked List implementation of Stack ADT



Stack ADT

- Linear Data Structure
- Elements are arranged in sequential
- Follows LIFO-Last In First Out mechanism
- Example-Plates in tray
- Arranging the coins ,Books
- **Push**-Inserting the element into the stack
- **Pop**-Deleting the element from the stack



Implemented in two ways
Using Arrays
Using Linked List

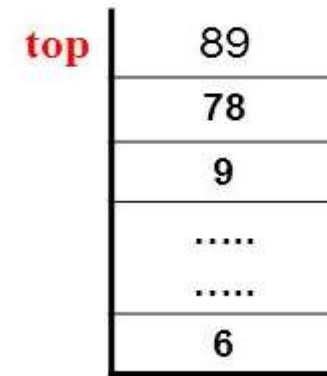


Stack

Overflow condition(push)

- Stack-5 elements
- Insert 6 th element
- Inserting an element to the stack which is already having maximum elements

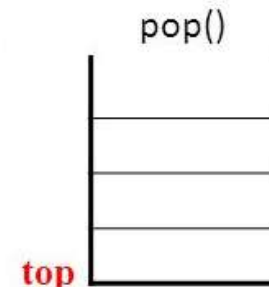
Push(2)!!



Stack Overflow

Underflow Condition

Deleting an element from the empty stack



Stack Underflow



Implementation of Stack Using Linked list

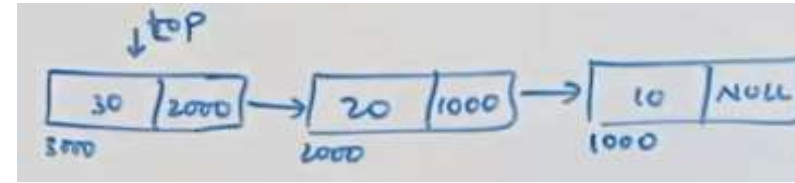
```
push ( )
new = (struct *node) malloc (sizeof (struct node));
scanf ("%d", &ele); 10, 20, 30
if (top == NULL)
{
    new -> data = ele;
    new -> next = NULL;
    top = new;
}
else
{
    new -> data = ele;
    new -> next = top;
    top = new;
}
```

Struct node
{
int data;
struct node *next;
}
new, temp, top;

The diagram illustrates the state of a stack and a linked list. On the left, a vertical stack is shown with elements 30, 10, and 20. On the right, another vertical stack is shown with elements 20, 10, and NULL, with an arrow pointing to the 20 element labeled 'top'. Below these, a linked list is shown with two nodes. The first node contains '20' and '1000' (with '2000' written below it), and an arrow points to the second node which contains '10' and 'NULL' (with '1000' written below it). An arrow labeled 'top' points to the first node.



Implementation of Stack Using Linked list



```
POP ()
if ( top == NULL )
{
    printf ( " STACK IS EMPTY " );
}
else
{
    temp = top;
    ele = top->data; printf ( " %d is deleted ", top->data);
    top = top->next;
    temp->next = NULL;
    free (temp);
}
```



Implementation of Stack Using Linked list

Display Function

```
Display ( )
{
  if ( top == NULL )
  {
    printf ( " STACK IS EMPTY ");
  }
  else
  {
    temp = top;
    while ( temp != NULL )
    {
      printf ( " %d ", temp->data );
      temp = temp->next;
    }
  }
}
```

temp = 3000 ✓
temp = 2000 ✓
temp = 1000 ✓
temp = NULL ✗



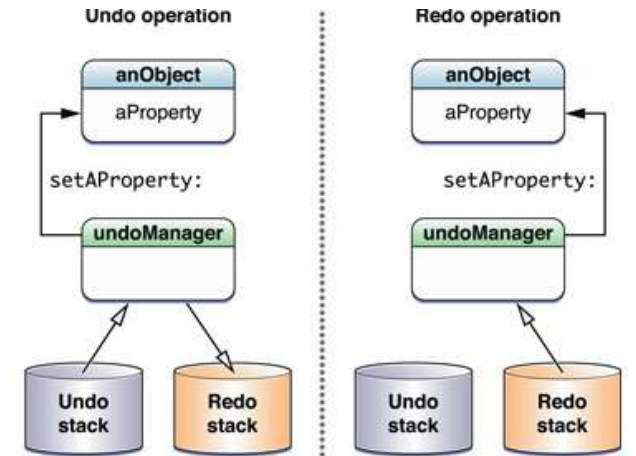
Applications of Stack

➤ Evaluating arithmetic Expression

➤ Infix to Postfix Conversion

➤ Evaluating the Postfix Expression

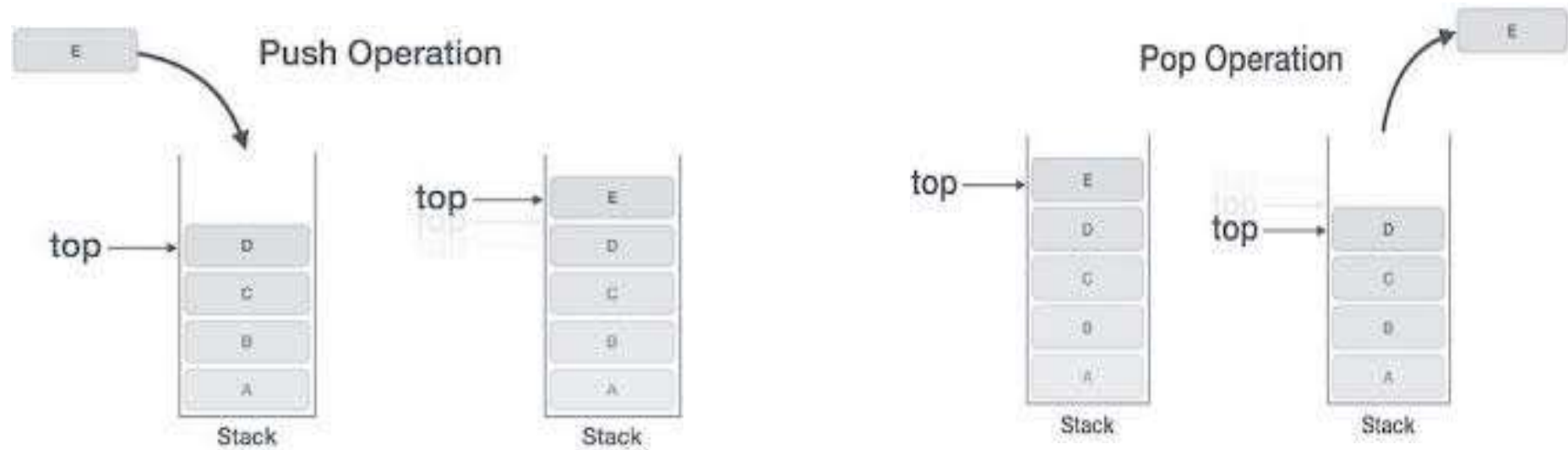
- Balancing the Symbols
- Undo/Redo
- Reverse a string
- Towers of Hanoi
- Function calls
- 8 Queen Problem





Assessment

1. How to do Push and POP Operations



2. Tell any two applications of Stack



References

1. M. A. Weiss, “Data Structures and Algorithm Analysis in C”, Pearson Education, 2nd Edition, 2002.
2. A. V. Aho, J. E. Hopcroft and J. D. Ullman, “Data Structures and Algorithms”, Pearson Education, 2nd Edition, 2007
3. Ashok Kamthane, " Data Structures Using C ", Pearson Education, 2nd Edition, 2012.
4. Sahni Horowitz, “Fundamentals of Data Structures in C”Universities Press; Second edition 2008



Thank You