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DATA STRUCTURES

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Data Structures---Introduction

- It is a logical or mathematical organization of data in computer memory.
- Types of data structures
  - Linear vs Non- linear
  - Static vs Dynamic

- Linear Data Structures
  - Elements arranged in sequential order
  - Eg: Arrays, Stack ,Queue,Linked List
- Non Linear Data Structures
  - Elements arranged in random order
  - Eg: Trees, Graphs

- Static Data Structures
  - Size is fixed
  - Eg: Array
- Dynamic Data Structures
  - Size is variable -- Can change at run time
  - Eg: Linked List

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ARRAYS

- Linear and static data structure.
- It is a collection of similar data items.
- Stored in contiguous memory location.
- Elements in the array are accessed using their index value.
- Eg: int a[10]; int b[3][2];

STACK

- Linear data structure
- A collection of similar data items (Same data type)
- Can be represented using both
  - array (Static)
  - linked list (Dynamic)

- LIFO(Last In First Out) structure
- Insertion operation—Push
- Deletion operation—Pop
- Insertion and deletion occurs only at one end ---- top
- Top is a pointer that keeps track of the top element in the stack

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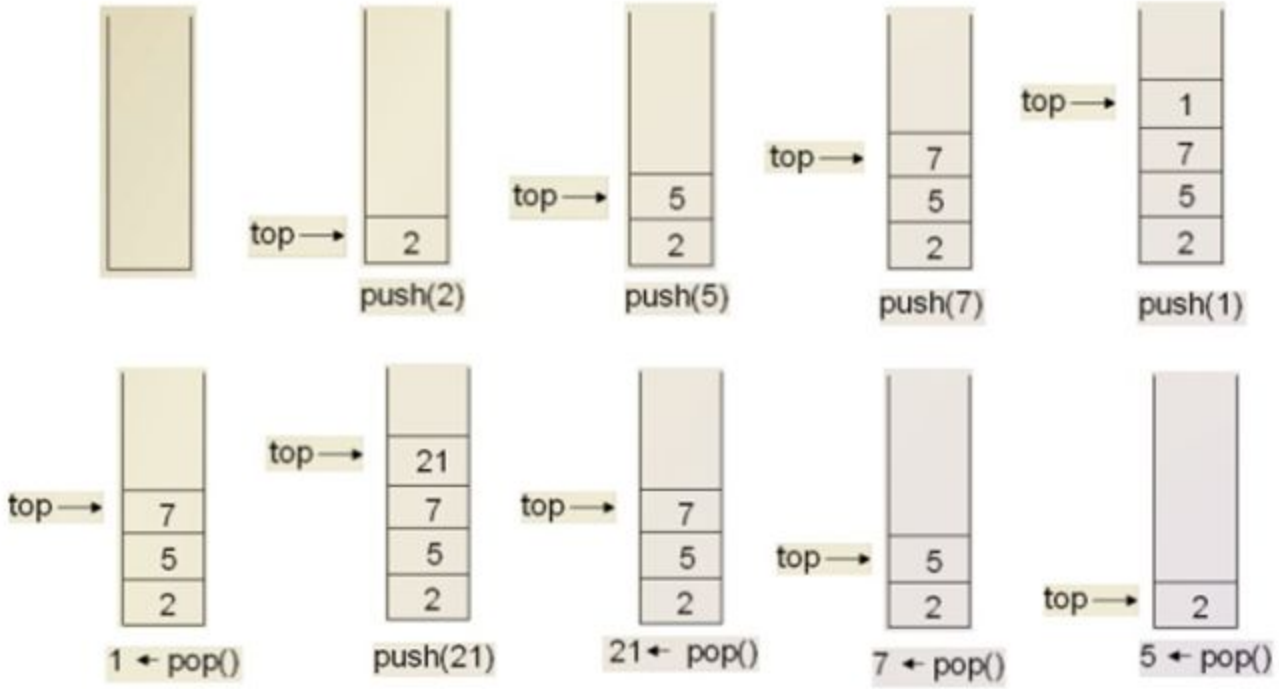
Push operation

- Top=Max---stack is full
- If Stack is full—Can’t insert new element -----Overflow condition
- Before inserting new element -----top=top+1

Pop operation

- Top=0-----stack is empty
- If stack is empty----Can’t delete------Underflow condition
- After deleting an element----top=top-1

Stack Operations



STACK USING ARRAY

PUSH(STACK,TOP,MAX,ITEM)

Algorithm to push an item into stack.

1.IF TOP == MAX then Print “Stack is full”;

Exit;

2.Otherwise TOP: = TOP + 1; /*increment TOP*/

STACK[TOP]:=ITEM

3.End of IF

4.Exit

POP(STACK,TOP,ITEM)

Algorithm to pop an element from stack.

1)IF TOP == 0 then Print “Stack is empty”;

Exit;

2) Otherwise ITEM: =STACK [TOP];

TOP:=TOP – 1;

3) End of IF

4) Exit

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Applications

- Recursion
- Reverse a string
- Check balance of parenthesis
- Infix to postfix conversion
- Infix to prefix conversion

Applications cont...

- Postfix evaluation
- Graph traversal ---DFS
- Tree traversals
- Topological sorting
- Implementing quick sort

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Questions

1.Stack can be represented by

(a). array only

(b). linked list only

(c). both (a) and (b)

(d). Neither (a) or (b)

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2. In a stack, the data item placed on the stack first is,

(a).The first data item to be removed

(b).The last data item to be removed

(c).Not given as index number

(d).None of these

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3.Example for LIFO structure

(a).Queue

(b).Linked list

(c).Graph

(d).Stack

4. Which of the following is useful in traversing a given graph by depth wise?

(a).List

(b).Queue

(c).Set

(d).Stack

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5. Stack is useful for implementing

(a).Radix sort

(b).Breadth first search

(c).Recursion

(d).None of these

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THANK YOU