

# CS & IT ENGINEERING



**Data Structures**

**Stacks and Quesues**

**DPP 01 Discussion Notes**

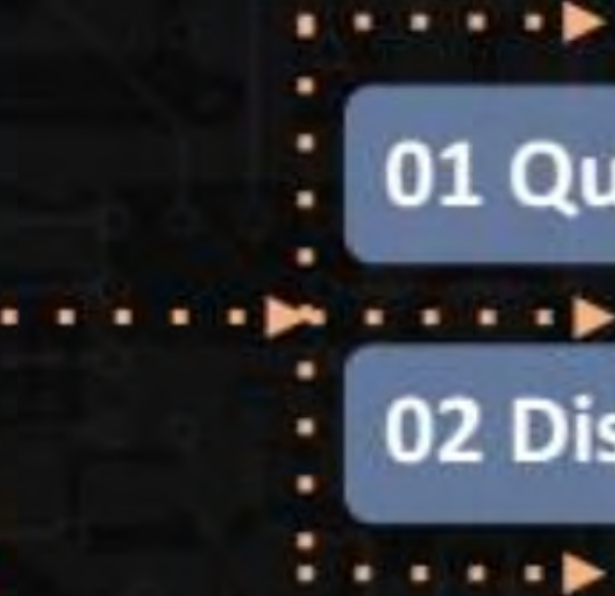


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## TOPICS TO BE COVERED



01 Question

02 Discussion

Q.1



Consider the following sequence of operations on an empty stack:

push (5); push (2); pop(); push(4); push(6); p=pop(); q=pop();  
r=pop();

The value of  $p+q-r$  is- 5.

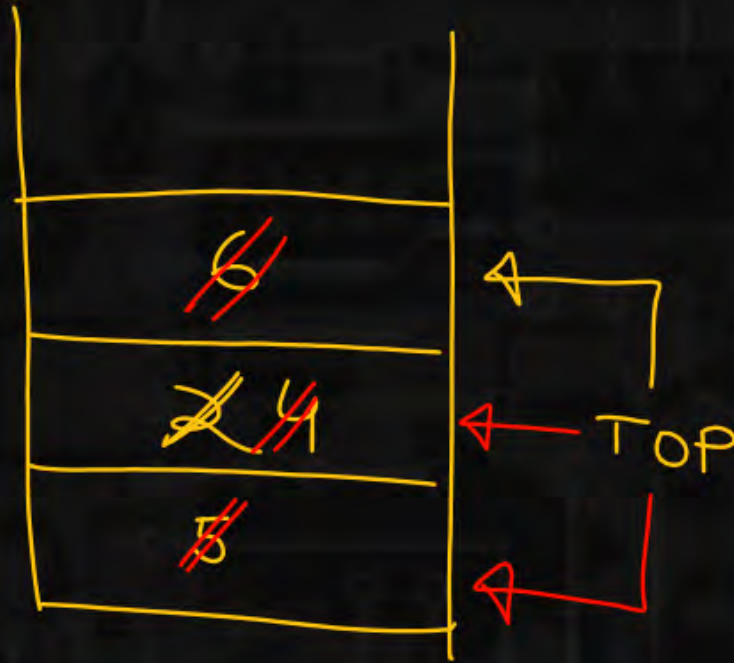
$$6 + 4 - 5 = 5$$

[NAT]

$$p = 6$$

$$q = 4$$

$$r = 5$$





Q.2

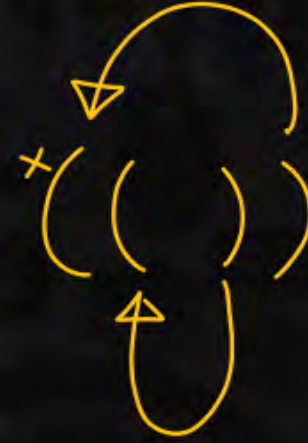
Which of the following includes the applications of stack?



[MCQ]

- ☒ A Recursive function calls
- ☒ B HTML and XML Tag matching
- ☒ C Checking if an expression contains balanced parantheses.
- ☐ D Finding the maximum element in a given sequence.

A, B, C





Q.3

A stack is implemented using array.  $S$  represents the pointer to the top element in the stack. Initially the stack contains the elements:  $a(\text{top})$ ,  $b$ . Assume  $\text{Push}(S, i)$  push an element  $i$  into the stack at index  $S$ . Whenever a Push operation will be performed, it will returns  $S++$  after the push operation.  $\text{Pop}()$  pops the topmost element and returns the next top index.  $\text{Top}()$  is a function that returns the topmost element of the stack. Consider the following statements:

P:  $\text{Top}(\text{Pop}(\text{Pop}(\text{Pop}(\text{Push}(\text{Push}(S, c), d)))) = a$

Q:  $\text{Pop}(\text{Pop}(\text{Pop}(\text{Pop}(\text{Push}(\text{Pop}(\text{Push}(S, c)), d)))) = a$

Which of the following statements is/are INVALID?

[MCQ]

☐ B P only

☐ A Q only

☒ C Both P and Q

☐ D Neither P nor Q

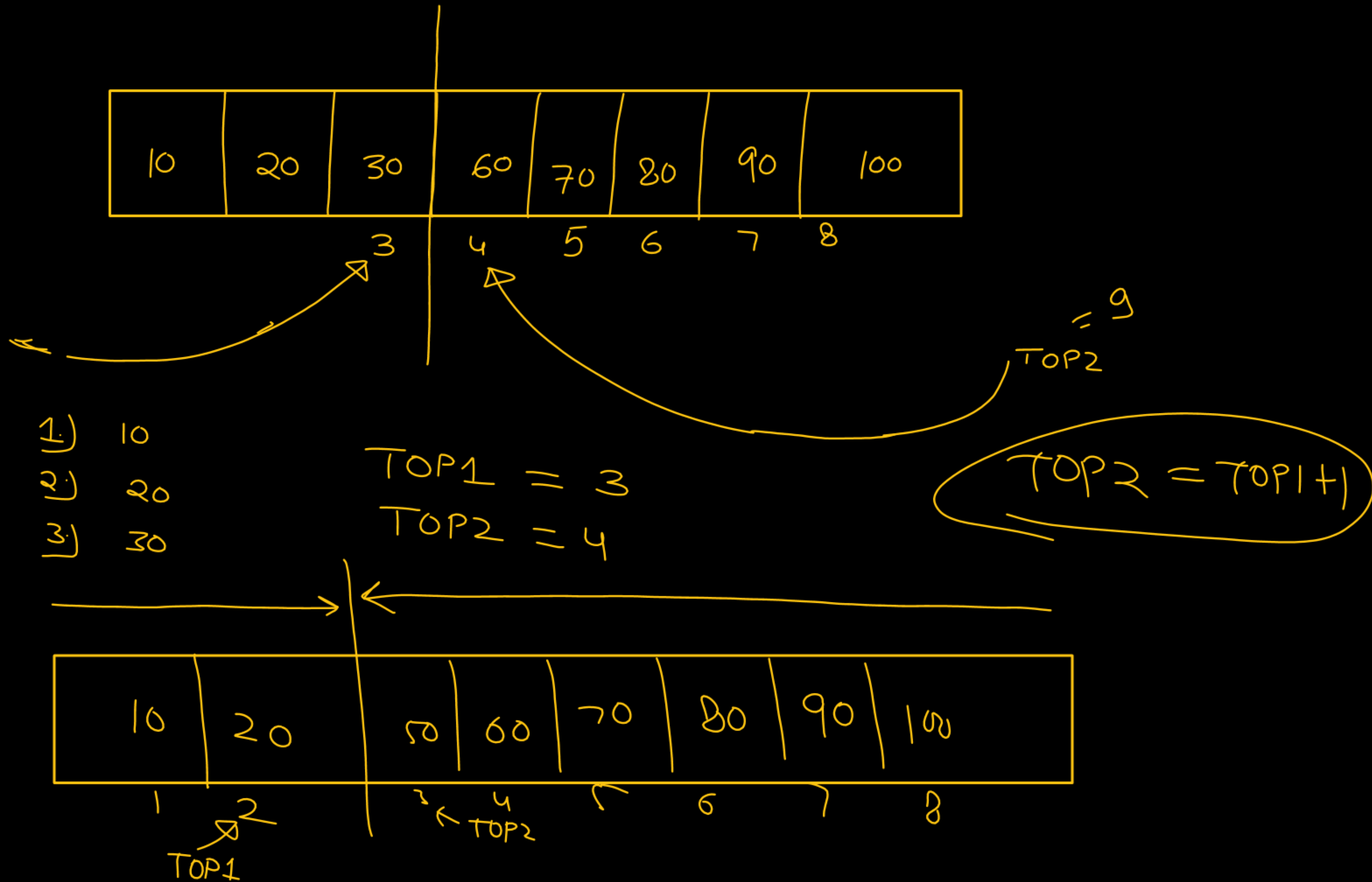




Q.4

A single array  $A[1 \dots \text{MAXSIZE}]$  is used to implement two stacks. The two stacks grow from opposite ends of the array. Variables  $\text{top1}$  and  $\text{top2}$  ( $\text{top1} < \text{top2}$ ) point to the location of the topmost element in each of the stacks. If the space is to be used efficiently, the condition for "stack full" is- [MCQ]

- A  $(\text{top1} = \text{MAXSIZE}/2)$  and  $(\text{top2} = \text{MAXSIZE}/2 + 1)$
- B  $(\text{top1} = \text{MAXSIZE}/2)$  or  $(\text{top2} = \text{MAXSIZE}/2 + 1)$
- C  $\text{top1} + \text{top2} = \text{MAXSIZE}$
- ☒ D  $\text{top1} = \text{top2} - 1$





Q.5



[MCQ]

A stack is implemented using a singly linked list that uses node structure-

```
struct node{  
    int data;  
    struct node *next;  
}node;
```

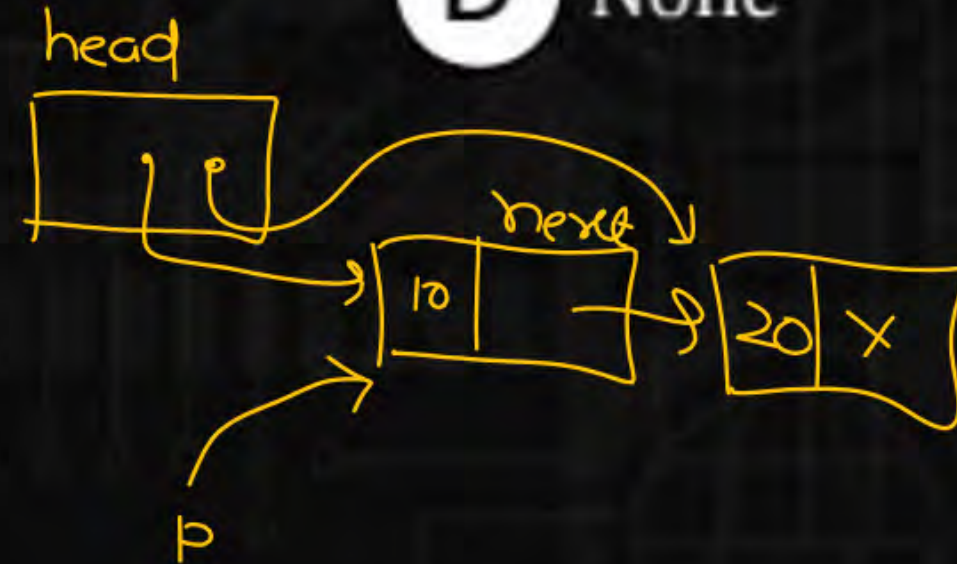
Let head denote the address of the start node respectively. Assume, the stack is not empty.

Consider the following function that intends to delete the topmost element of the stack:

```
node * f(node *head){  
    node *p=head; _____;  
    free(p);  
    p=NULL;  
}
```

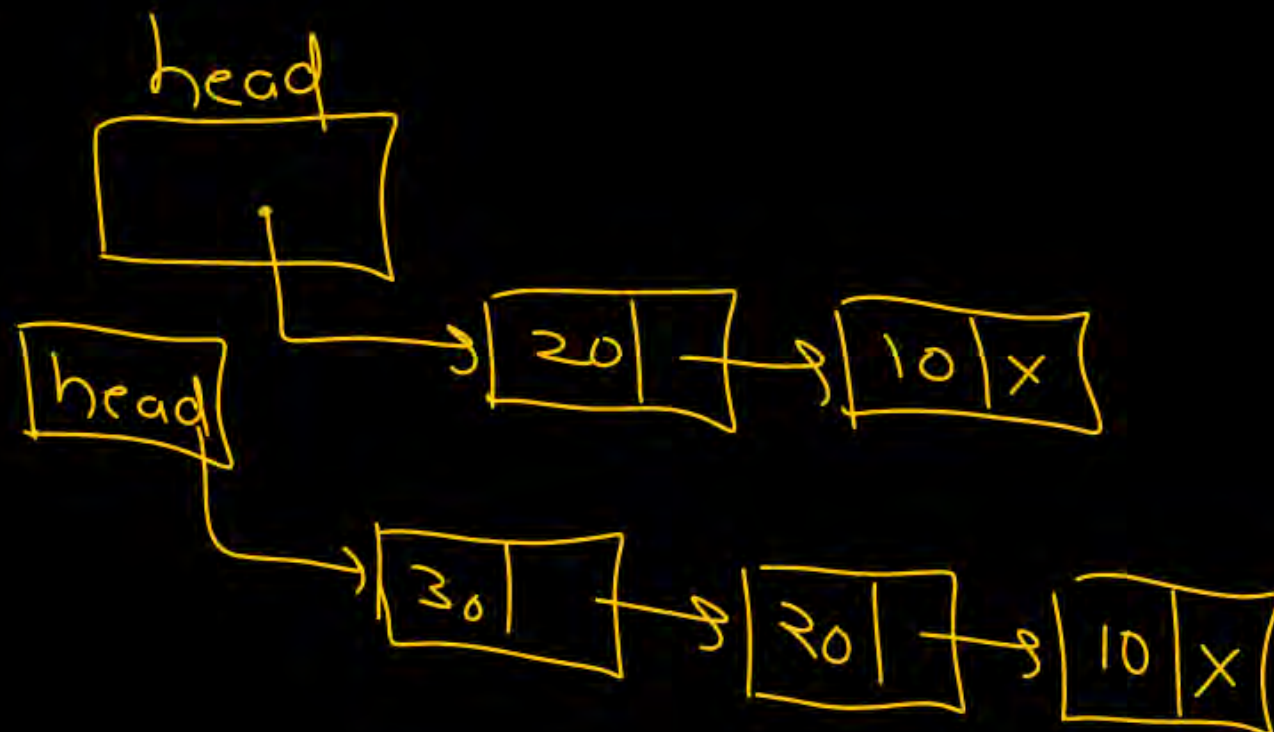
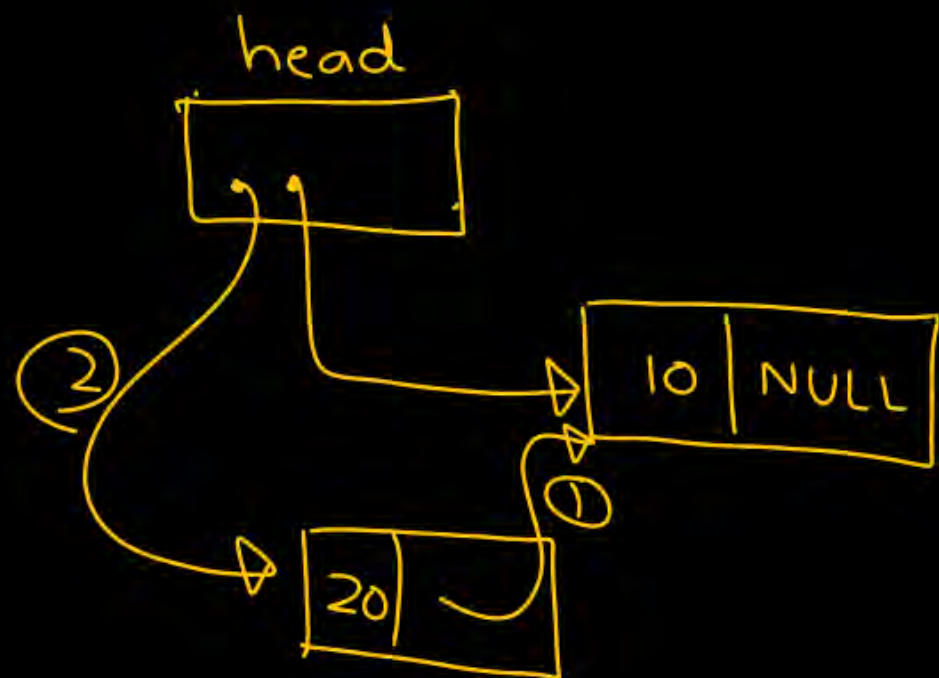
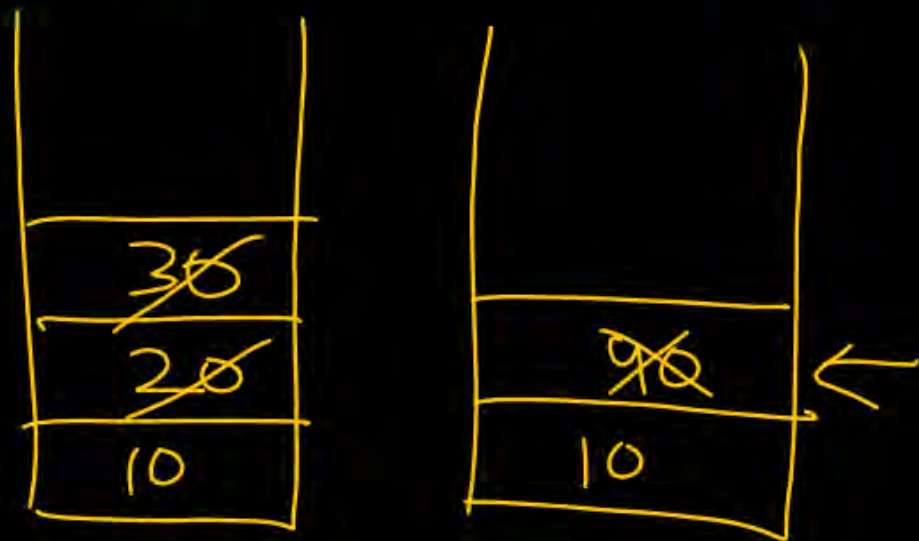
The missing blank is-

- ☒ A while(p → next!=NULL)  
p=p→next;
- ☐ B p=p → next;
- ☒ C head=head → next;
- ☐ D None



Push

~~10~~, ~~20~~, 30, Pop, pop, push(40), pop





Q.6



Which one of the following permutations cannot be obtained in the output string using a stack and assuming that the input sequence is a, b, <sup>x</sup>c, d, e in the same order?

$\xrightarrow{\quad}$   $\xrightarrow{\quad}$  A, B

~~A~~ c d e a b

~~B~~ a e b c d

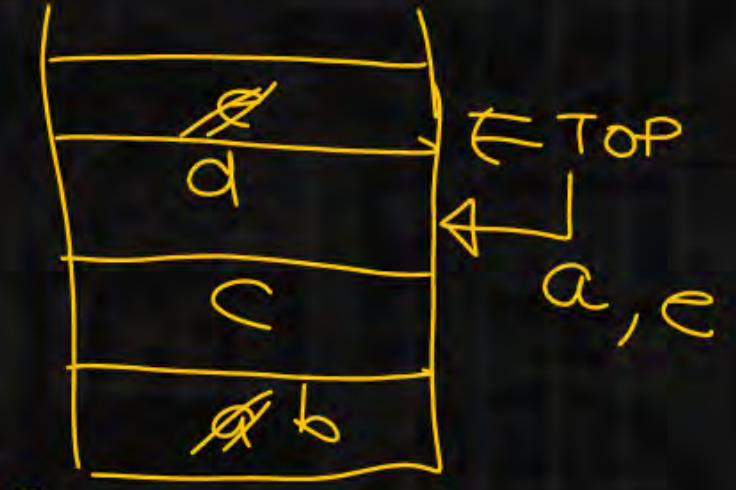
~~C~~ c d e b a

~~D~~ e d c b a

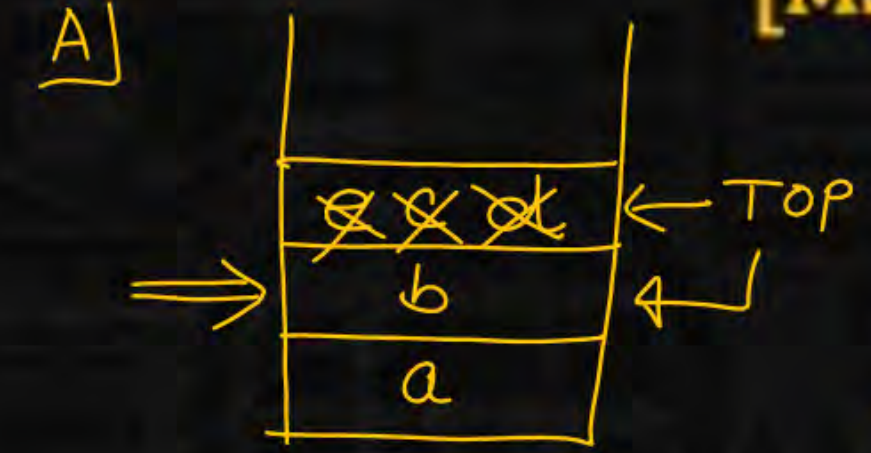
Pop()  
Push(a)  
Pop()  
Push(e)  
Pop()  
Pop()



Push(a)  
Pop()  
Pop()  
Push a, b, c, d, e



Pop()  
Push(a)  
Pop()  
Push(e)  
Pop()



[MSQ]

c d e



Q.7



A stack is implemented using array of size 4.  $S$  represents the pointer to the top element in the stack. Initially the stack contains the elements-  $a(\text{top})$ ,  $b$ . Assume  $\text{Push}(S, i)$  push an element  $i$  into the stack at index  $S$ . Whenever a Push operation will be performed, it will returns  $S++$  after the push operation.  $\text{Pop}()$  pops the topmost element and returns the next top index.  $\text{isEmpty}()$  returns TRUE if the stack is empty.  $\text{isFull}()$  returns TRUE if the stack is full. Consider the following statements:

Valid

P:  $\text{isFull}(\text{Push}(\text{Pop}(\text{Push}(\text{Push}(S, c), d))), e)) = \text{TRUE}$

Valid

Q:  $\text{isEmpty}(\text{Push}(\text{Pop}(\text{Pop}(\text{Push}(\text{Pop}(\text{Push}(S, c)), d))))), e) = \text{FALSE}$

(C)

Which of the following statements is/are VALID?

[MCQ]

**A**

P only

**B**

Q only

**C**

Both P and Q

**D**

Neither P nor Q



b	<del>e</del>	<del>x</del>	
---	--------------	--------------	--

0

↑  
S

↑  
S

↑  
S

b	a	c	e
---	---	---	---

0

1

2

3

4

↑  
S

↑  
S



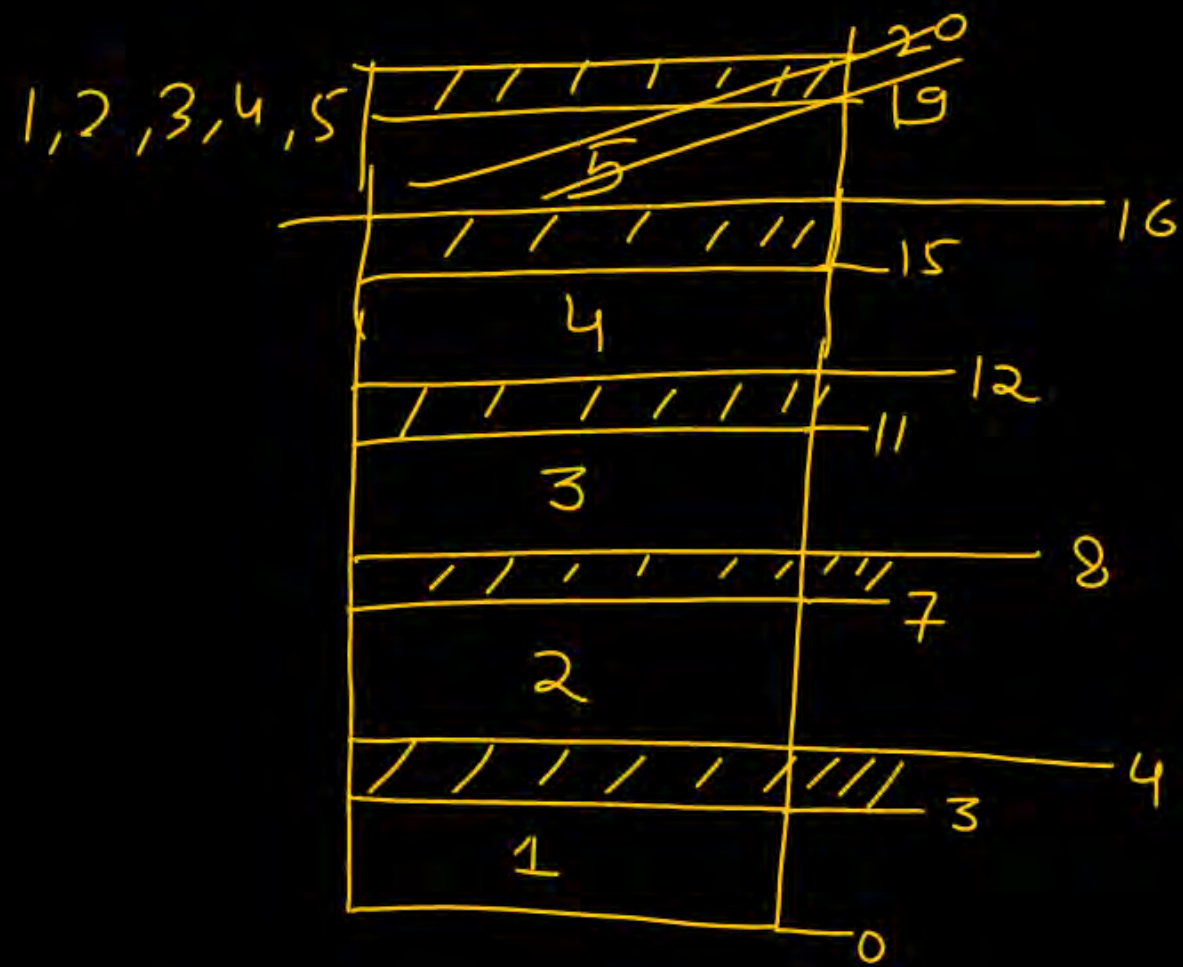
Q.8

Let  $S$  be a stack of size  $n \geq 1$ . Starting with the empty stack, suppose we push the first 5 natural numbers in sequence, and then perform 5 pop operations. Assume that Push and Pop operations take 3 seconds each, and 1 seconds elapse between the end of one such stack operation and the start of the next operation. The average stack-life of an element of this stack is

17.

[NAT]





1] Push(1)

2] Push(2)

3] Push(3)

4] Push(4)

5] Push(5)

	Push ends	Pop start	Pop end
1	3	36	39
2	7	32	35
3	11	28	31
4	15	24	27
5	19	20	23

$$\text{Avg life} \Rightarrow \left( (20-19) + (24-15) + (28-11) + (32-7) + (36-3) \right) / 5$$

$$= (1+9+17+25+33) / 5$$

$$= \boxed{17}$$



