

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

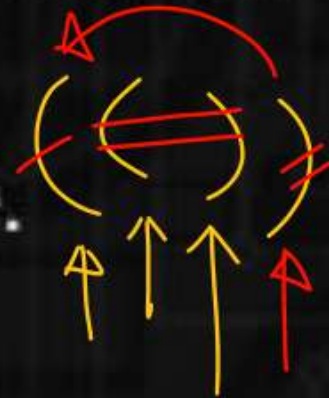
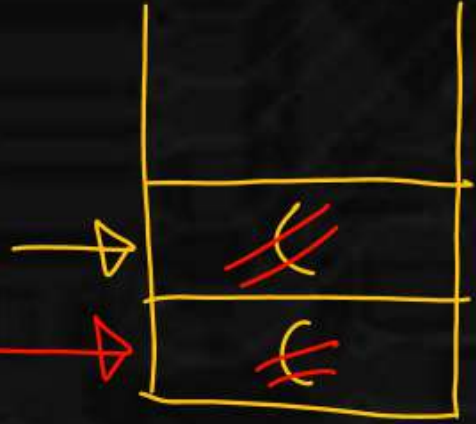
Which of the following includes the applications of stack?



[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:

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

Incorrect
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

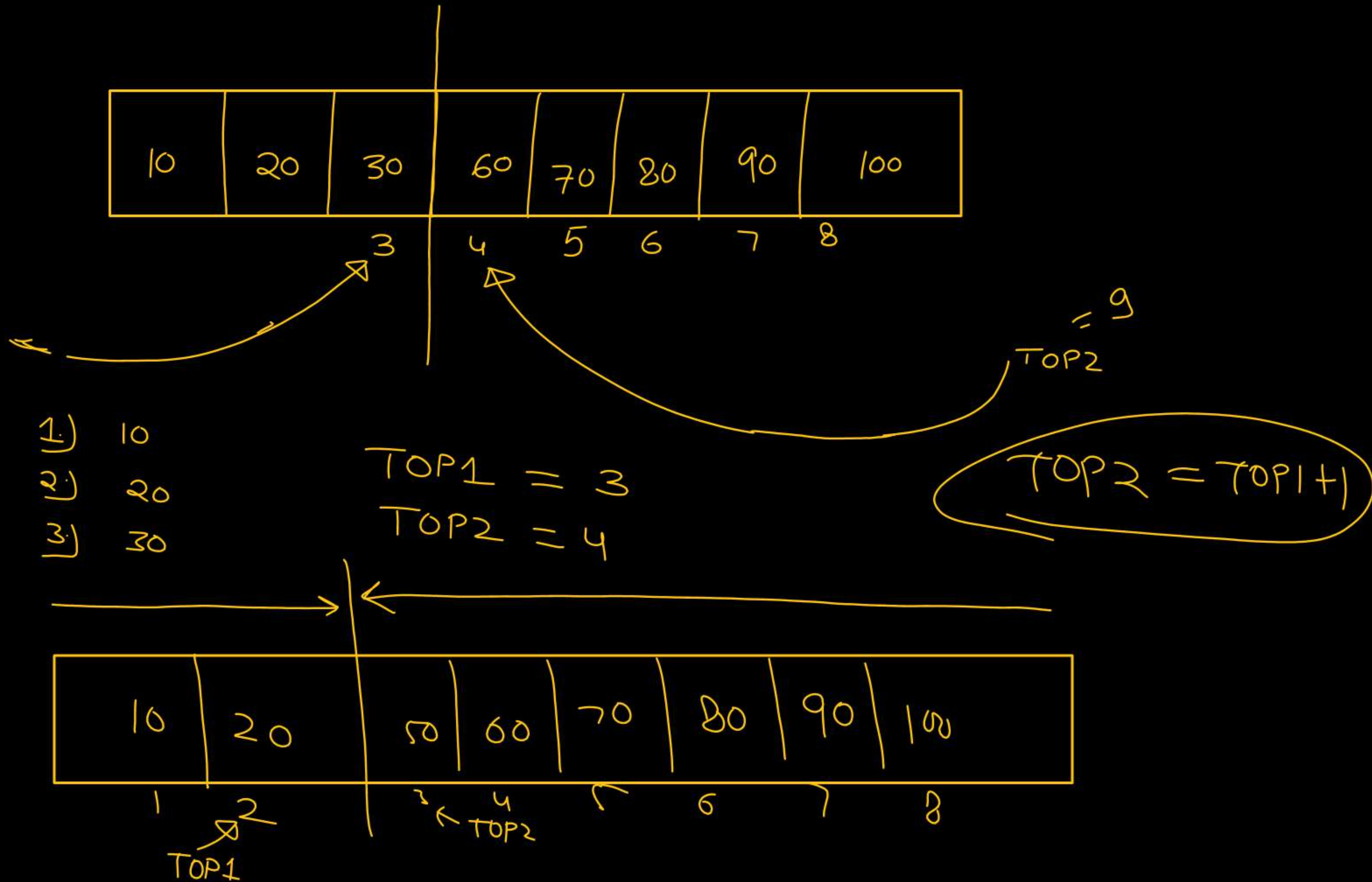
☐ D Neither P nor Q

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 top1 and 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;
```

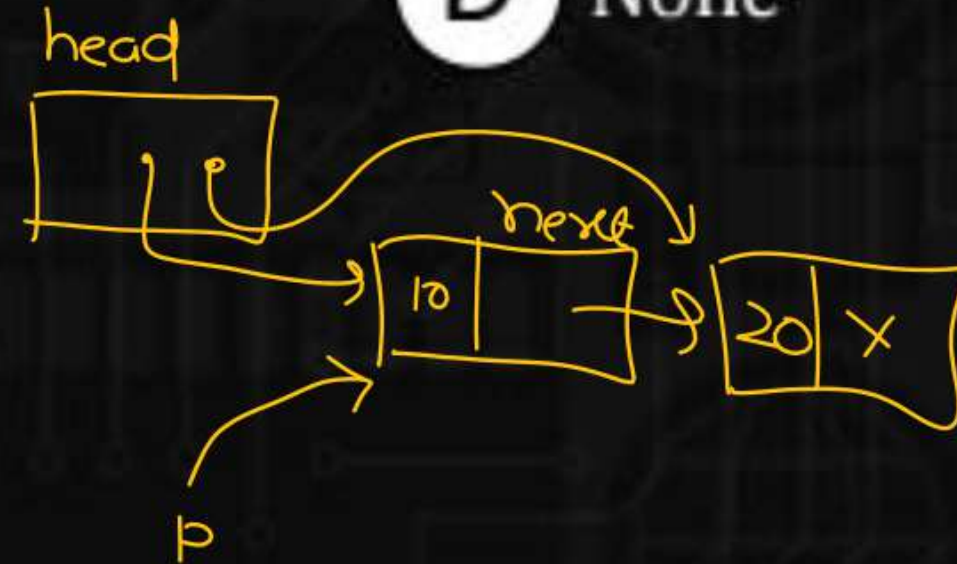
Let head denote the address of the start node respectively. Assume, the stack is not empty.

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;  
}
```

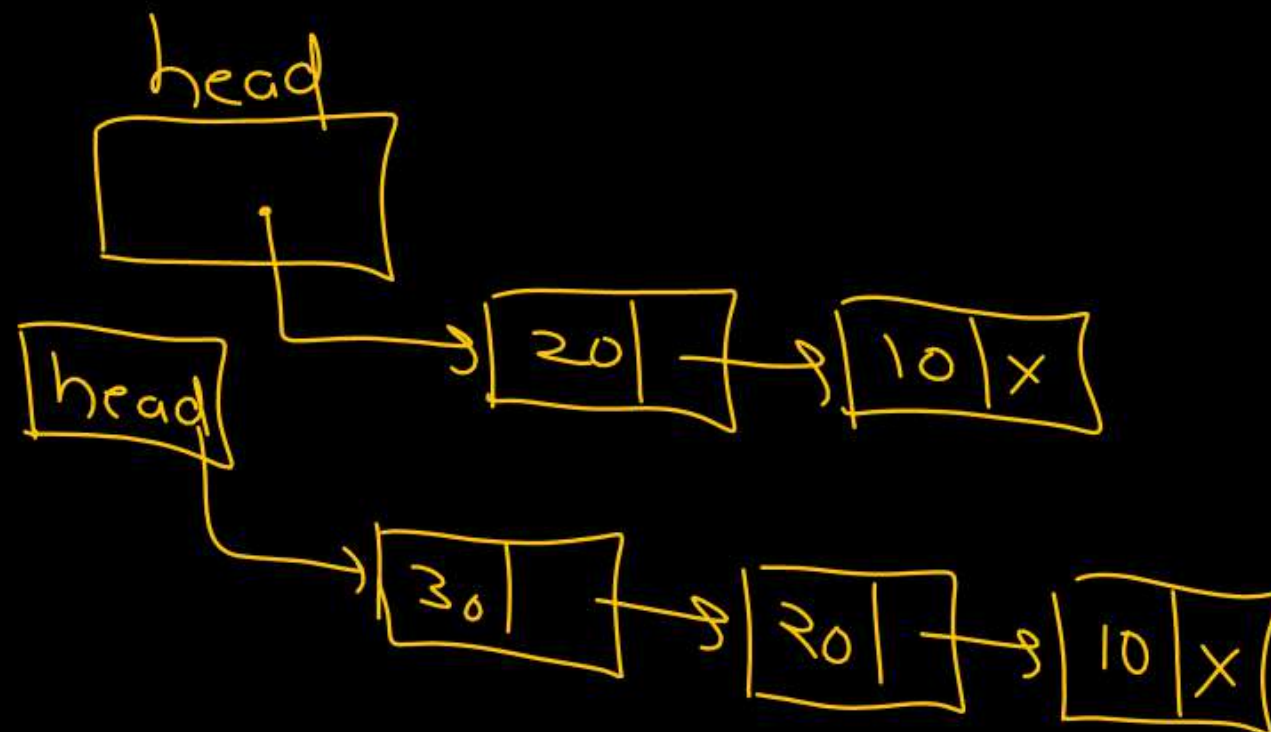
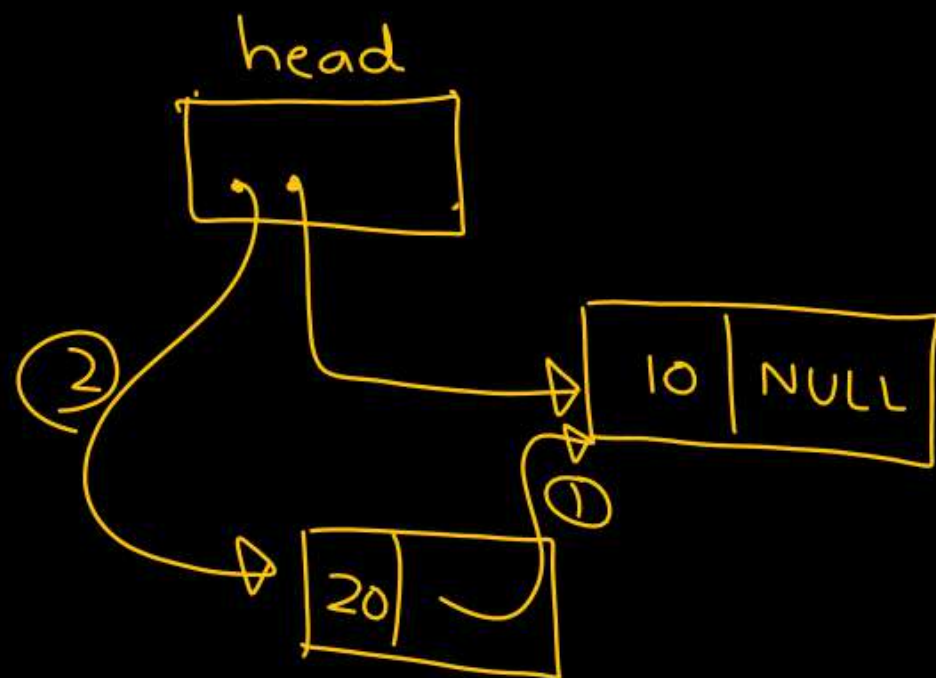
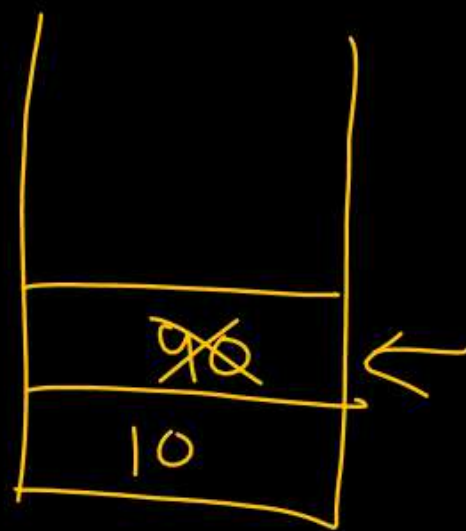
The missing blank is-

- ☒ A while($p \rightarrow \text{next} \neq \text{NULL}$)
 $p = p \rightarrow \text{next};$
- ☐ B $p = p \rightarrow \text{next};$
- ☒ C $\text{head} = \text{head} \rightarrow \text{next};$
- ☐ 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, ^xc, d, e in the same order?

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

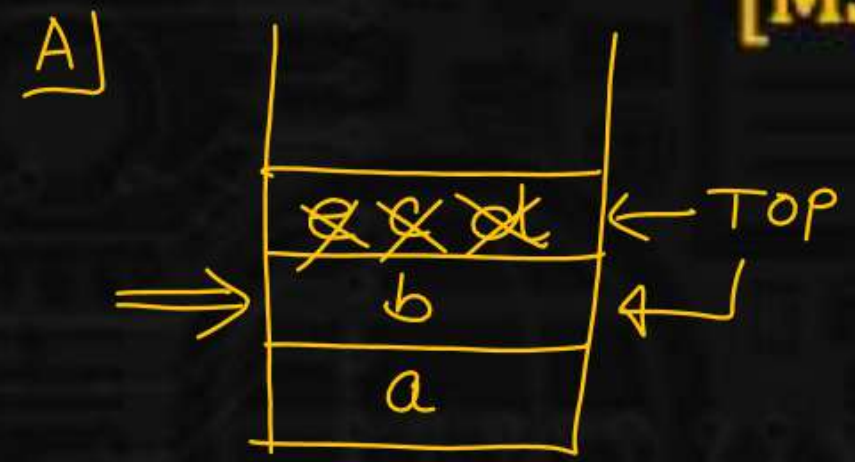
c d e
[MSQ]

~~A~~ c d e a b

~~B~~ a e b c d

~~C~~ c d e b a

~~D~~ e d c b a

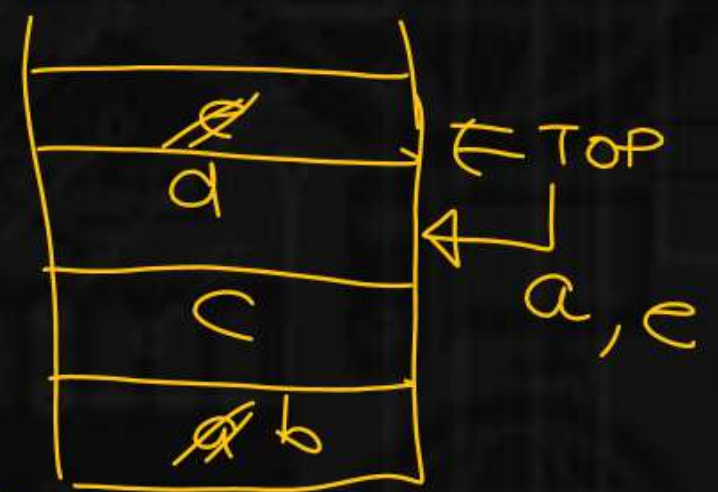


Pop()
Push(a)
Pop()
Push(e)
Pop()

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



Push(a)
Pop()
Pop()
Push a, b, 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	e	x	
---	--------------	--------------	--

0

1

2

3

↑
S

↑
S

↑
S

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

0

1

2

3

4

↑
S

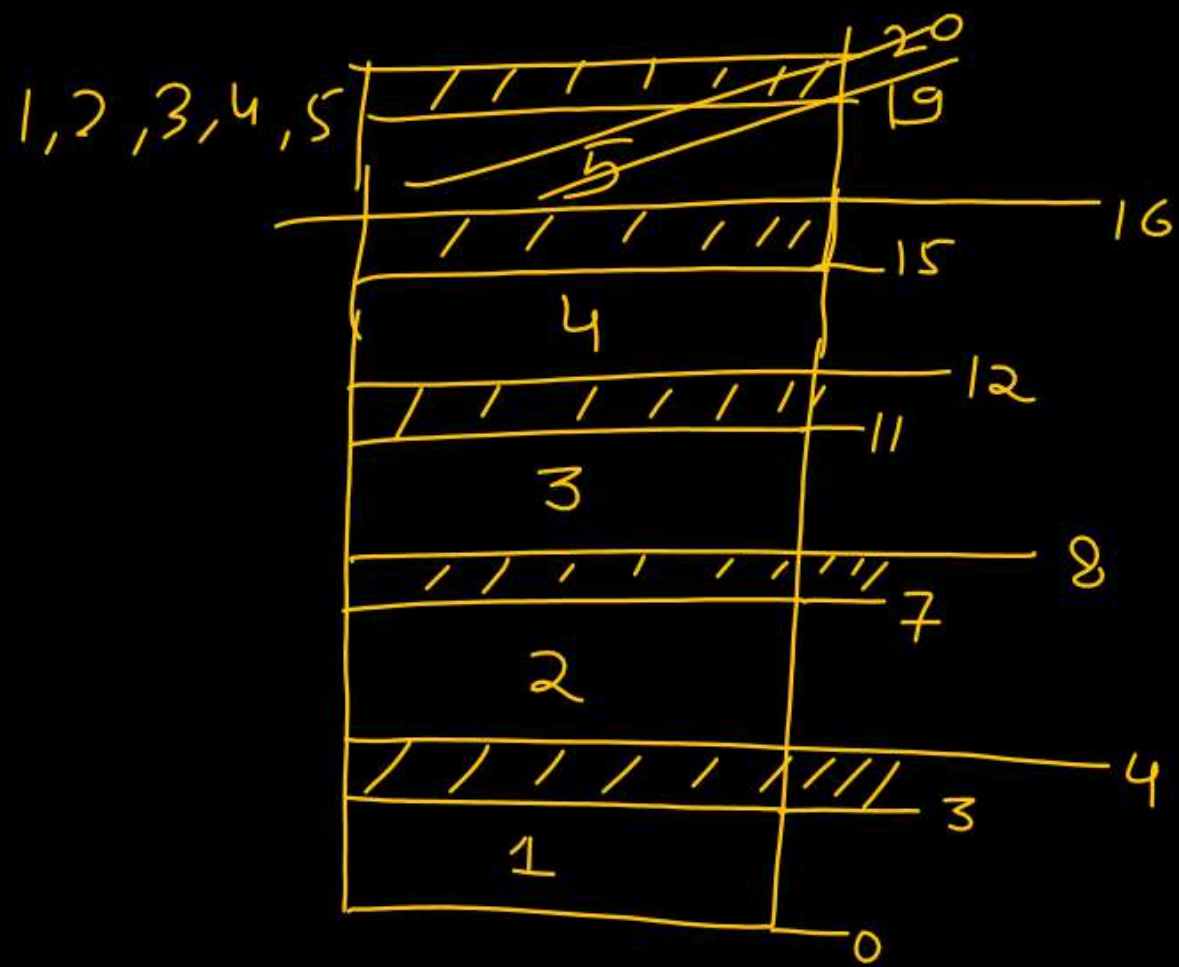
↑
S

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

$$\begin{aligned}
 \text{Avg life} &\Rightarrow ((20-19) + (24-15) + (28-11) + (32-7) + (36-3)) / 5 \\
 &= (1 + 9 + 17 + 25 + 33) / 5 \\
 &= \boxed{17}
 \end{aligned}$$

