

COMPUTER SCIENCE AND DA

Data Structures through Python

Stack

Lecture No. 02



By- Kashif Sir

Topics to be Covered

Stack





STACK PERMUTATION



1 2 3 4 5



The push sequence order of elements in stack can be static (fixed) or dynamic (random).

The possible no. of permutations for pop will be $\frac{2^n n!}{n+1}$ and $n!$.

If elements to be pushed are dynamic: Stack S, a, b, c

	<div>PUSH(a) PUSH(b) PUSH(c) - POP() - POP() - POP() cba</div>	<div>PUSH(a) POP() PUSH(b) PUSH(c) POP() POP() acb</div>		<div>PUSH(b) POP() PUSH(c) PUSH(a) POP() POP() bac</div>	<div>PUSH(b) PUSH(a) POP() POP() PUSH(c) POP() abc</div>	<div>PUSH(b) POP() PUSH(a) PUSH(c) POP() POP() bca</div>	<div>PUSH(a) PUSH(c) POP() POP() PUSH(b) POP() cab</div>
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STACK PERMUTATION



If the elements to be pushed in a fixed sequence abc are $\left\{ \begin{matrix} \text{ Catalan number} \\ \frac{2^n C_n}{n+1} \end{matrix} \right\}$ in a fixed sequence 5

$$= \frac{{}^6C_3}{4} = \frac{6!}{3!3!4} = \frac{720}{72 \times 4} = \frac{720}{288} = \frac{5}{4}$$

PUSH(a)
PUSH(b)
PUSH(c)
POP()
POP()
POP()
cba

PUSH(a)
PUSH(b)
POP()
POP()
PUSH(c)
POP()
bac

PUSH(a)
PUSH(b)
POP()
PUSH(c)
POP()
POP()
bca

PUSH(a)
POP()
PUSH(b)
POP()
PUSH(c)
POP()
abc

PUSH(a)
POP()
PUSH(b)
PUSH(c)
POP()
POP()
acb

cab
PUSH(a)
PUSH(b)
PUSH(c)
POP()
X



STACK PERMUTATION



Q) Consider a stack that accepts insertion of 4 elements in the order, A, B, C, D only. Then which of the following output sequence is/are valid? (MSQ)

✓ 1) A, C, B, D

✓ 2) B, D, C, A

✗ 3) C, D, A, B

✓ 4) B, A, D, C

BAD C



A C B D



(D)



B D C A



STACK PERMUTATION

Q1 Consider a stack with fixed push sequence of elements and o/p sequence pair given below. which of the below pair(s) is/are invalid?



5

PUSH Sequence

O/p Sequence



34251



31245



31245

~~(A)~~

(1, 2, 3, 4, 5)

,

3, 4, 2, 5, 1

~~(B)~~

(5, 4, 3, 2, 1)

,

3, 1, 2, 4, 5

~~(C)~~

(1, 3, 5, 2, 4)

,

3, 1, 2, 4, 5

~~(D)~~

(2, 4, 5, 3, 1)

,

5, 2, 3, 4, 1

THANK - YOU