

Q. Formula Proof :

Page No.	
Date	

\* Push()   
  $i(i = \text{low})$    
  $\left( \text{capacity} = C_0 \right)$

The edge case is the case when the  $\text{size} = \text{capacity}$ .

∴ now, we generate a new array double the ~~size~~ capacity of original array and copy the elements from that to it.

∴ if the ~~start~~ size of array (before generating new)   
  $= n$

then it takes  $= 2n$  (to generate new array)

$= N$  (to copy elements from original array to new array...)

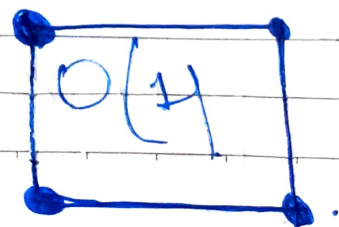
∴ A total of  $O(3n)$  time.

∴ For best of worst Push operation, the place is  $O(1)$  time.

∴ For a given  $n$  Push operation =

$$\begin{aligned} T(n) &= 1 + 1 + \dots + 3 \cdot 2^0 + 1 + \dots + 3 \cdot 2^{n-1} \\ &\quad + \dots + 1 + (3 \cdot 2^{n-1}) \\ &= \dots \end{aligned}$$

$$T(n) = 3(n+1) + n = 4n + 3$$



\* Pop;

while popping out the elements;

The edge case arises when;

$$\left( \text{size} = \frac{\text{capacity}}{4} + 1 \right);$$

when this happens; a new memory is

allocated of ~~capacity~~ capacity =  $\left( \frac{\text{capacity}}{4} \right) * 2$ ;

as the elements are copied;

$$\text{if } \frac{\text{capacity}}{4} = n$$

$$\text{this takes; } \left( \frac{n}{4} \right) * \left( \frac{n}{4} \right) = \left( \frac{n}{4} \right) \text{ time.}$$

otherwise given;

Pop operation takes  $O(1)$  time,

1.

$$\text{④ } T_n = 1 + 1 + 1 + \dots + 2 + 2$$

$$\left( \begin{array}{c} + \dots + 2 \cdot 2^{i_{n-1}} + \dots + 2 \cdot 2^{l_0} \\ + \dots + 1 + 1 + \dots \end{array} \right)$$

$$\frac{n(n+1)}{2} + n \approx \boxed{O(n^2)}$$

Therapy  
omitted  
cost

here we take the  
threshold to  
be 25% of  
original size.

Page No.  
Date

Comment:

Page No

Date

Let the growing factor was 2 ;

Let the shrinking factor was  $\frac{1}{4}$ .

This was done to ensure hysteresis

(which will prevent simultaneous growing and shrinking ...)

This makes the average cost  
still  $O(1)$ .