Ridhima Gandhi
G
08

Tutorial - 2

Q1 Write time complexity of below code

$j = 1$ $\quad$ $i = 1$

$j = 2$ $\quad$ $i = i + 2$

$j = 3$ $\quad$ $i = 1 + 2 + 3$

for (i)

$\therefore \; 1 + 2 + 3 + \ldots + < n$

$1 + 2 + 3 + \ldots m < n$

$$\frac{m(m+1)}{2} < n$$

$$m \simeq \sqrt{n}$$

By summation method,

$$\sum_{i=1}^{m} = 1 + 1 + \ldots + \sqrt{n} \text{ times}$$

$$T(n) = \sqrt{n}$$

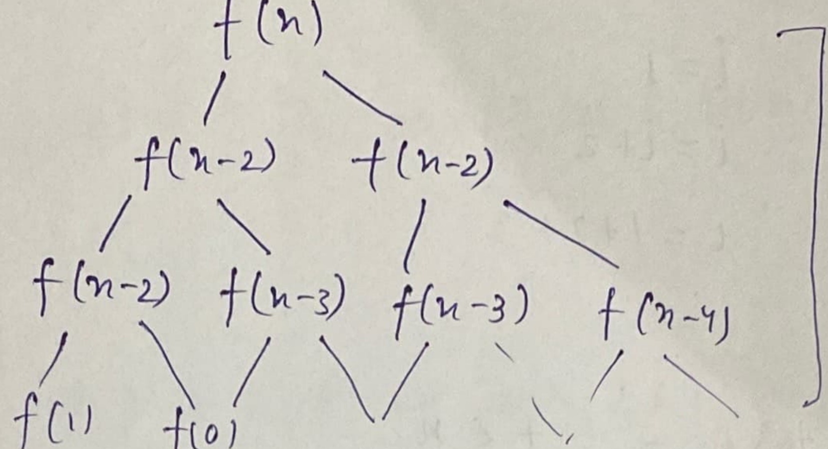
$$T.C = O(\sqrt{n})$$

Q2

For fibonicci series

$f(n) = f(n-1) + f(n-2)$ $\quad f(0) = 0$

$f(1) = 1$



n levels

∴ At every function cell we get 2 function calls.

∴ for n levels

we have = $2 \times 2 \ldots$ n times

$\therefore T(n) = 2^n$

<u>Space Complexity</u>

Considering recursive

Stack :

no of cells maximum size

For each call we have S.C O(1)

$\therefore T(n) = O(n)$

without considering recursive stack each call we have time complexity O(1)

$\therefore T(n) = O(1)$

Q3

i)

```
void quicksort (int arr[], int l, int n)
{
    if (l<n)
    {
        int p = partition (arr, l, h);
        quicksort (arr, l, p-1);
        quicksort (arr, p+1, h);
    }
}
int partition (int arr[], int l; int h)
{
    int pivot = arr [n];
    int i = l-1;
    for( j = l ; j<= n-1 ; j++)
    { if (arr[i]< pivot)
        {
            i++;
            swap( & arr[i] , & arr[j])
        }
    }
```

ii) n^3

```
for (i=0; i<n; i++)
  for (j=0; j<c1; j++)
  for (K=0; K<c1; K++)
  res[i][j] += arr[i][k] * b[k][j];
```

iii) $\log(\log n)$

```
for (i=2; j<n; j=i*i)
  count++;
```

Q5

for	i	j
		1
	1	
	2	1+3+5
	3	1+4+7
	⋮	⋮
	n	1+5+9

j = (n-1) times

$$\sum_{i=1}^{n} \left(\frac{n-1}{i}\right)$$

$$T(n) = n-1 + \frac{n-1}{2} + \frac{(n-1)}{3} + \cdots \frac{n-1}{n}$$

$$T(n) = n\left[1+\frac{1}{2}+\frac{1}{3}+\cdots+\frac{1}{n}\right] - 1\times\left[1+\frac{1}{2}+\frac{1}{3}+\cdots\frac{1}{n}\right.$$

$$= n\log n - \log n$$

$$T(n) = O(n\log n)$$

i where

for 2^1

2^k $\quad 2^k < m$

2^{k^2} $\quad k^m = \log_2 n$

2^{k^3} $\quad m = \log^k \log_2 n$

2^{k^n}

$\therefore \sum_{i=1}^{m} 1+1+1+\ldots m$ times

$T(n) = O(\log_k \log n)$

Q8

a) $100 < \log\log n < \log n < (\log n)^2 < \sqrt{n} < 8n <$
$n \log n < \log(n!) < n^2 < 2^n < n^n < 2^{2n}$

b) $1 < \log\log n < \sqrt{\log n} < \log n < \log 2n < 2\log n < n$
$< n\log n < 2n < 4n < \log(n!) < n^2 < n! < 2^{2n}$

c) $96 < \log_8 n < \log 2n < 5n < n\log_8(n) < n\log_2 n$
$< \log(n!) < 8n^2 < 7n^3 < n! < 8^{2n}$