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Pg - 1

DAA Assignment - 2

Ques 1 -

```
Void func (int n)
{   int j = 1, i = 0;
    while (i < n)
    {
        i + = j;
        j++;
    }
}
```

for $j = 1$ $\quad i = 1;$

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

$j = 3$ $\quad i = 1+2+3;$] m

$\because$ $1+2+3+ \cdots < n$

$1+2+3+m < n$

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

by summation Method

$\sum_{i=1}^{m} 1 \Rightarrow 1+1+ \cdots \sqrt{n}$ times

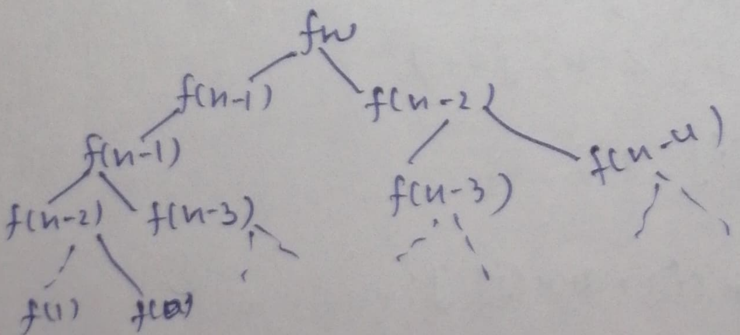
$\therefore$ $T(n) = \sqrt{n}$

Ques 2 -

for fibonacci Series -

$f(n) = f(n-1) + f(n-2)$

$f(0) = 0 \qquad f(1) = 1$



$\because$ at every function call we get two function calls for n levels.

we have $\Rightarrow$ $2 \times 2 \cdots\cdots n$ times

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

Maximum Space considering recursion Stack

no of calls max = n

for each call we have space complexity $O(1)$

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

Ques3- (a.) n logn :-

Quick Sort

```
Void func [int arr[], int l, int h)
  {
    if (l<h)
    {
      int pi = partion(a, l, h);
      func (arr, l, pi-1);
      func (arr, pi+1, h);
    }
  }
int partion (int arr[], int l, int h)
    int pi = arr [h];
    int i = (l-1);
  for (int j = l; j<=h; j++)
  {
    if (arr [i] < pi)
    {
      i++;
      Swap (arr [i], arr [j] ];
    }
  }
  Swap (arr [i+1], arr [h] );
  return (i+1);
}
```

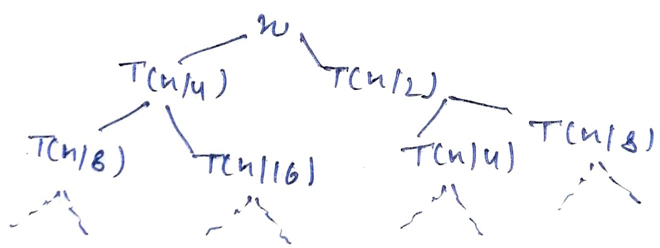
(b) n^3 : Multiplication of two Square Matrix

```
for (i=0; i<n; i++)
{
    for (j=0; j<c; j++)
    {
        for (k=0; k<c1; k++)
        {
            res[i][j] += a[i][k] *b[k][j];
```

(c) log (log n)

```
for ( i=2; i<n; i= i*i )
{
    c++;
}
```

Ques4- $T(n) = T(n/4) + T(n/2) + C*n^2$



— (1)

At level

$0 \rightarrow cn^2$

$1 \rightarrow \frac{n^2}{4^2} + \frac{n^2}{2^2} = \frac{c\,5n^2}{16}$

$2 \rightarrow \frac{n^2}{8^2} + \frac{n^2}{16^2} + \frac{n^2}{4^2} + \frac{n^2}{8^2} = \left(\frac{5}{16}\right)^2 n^2 c$

⋮

max level $= \frac{n}{2^k} = 1$

$\Rightarrow k = \log_2 n$

$\because T(n) - [cn^2 + (\frac{5}{16})n^2 + (\frac{5}{16})^2 + \cdots + (5/N)^{\log^n} n^2)$

$T(n) = cn^2 \left[1 + \frac{5}{16} + (\frac{5}{16})^2 + \cdots (\frac{5}{16})^{\log n}\right]$

$T(n) = cn^2 \times 1 \times \left[\frac{1 - (\frac{5}{16})^{\log n}}{1 - \frac{5}{16}}\right]$

$= cn^2 \times \frac{11}{5}\left[1 - (\frac{5}{16})^{\log n}\right]$

$\because T(n) = O(n^2 c) \Rightarrow O(cn^2)$

Ques5-

```
int fun (int n)
{
    for (i=j; i<=n ; i++)
    {
        for (j=1; j<n ; j+=i)
        {

        }
    }
}
```

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

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

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

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

$= n\log n - \log n$

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

for (i=2; i<=n; i = pow (i, k)]

{ O(1)

}

for → i

2^1

2^k

2^{k^2}

2^{k^3}

$\vdots$

2^{k^m}

where $2^{k^m} <= n$

$k^m = \log n$

$m \log k \ \log_2 n$

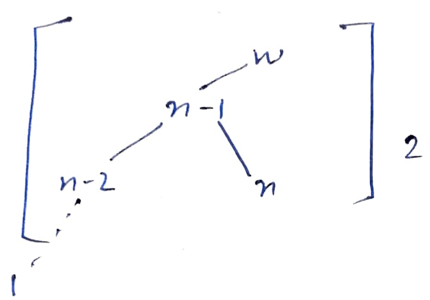
$\because \sum_{i=1}^{m} 1$

$\Rightarrow 1 + + + \cdots m$ times

$\Rightarrow T(n) = O[\log k \ \log n]$

Ques7 - Given Algo devides array in 99 % & 1 % part

$\therefore \quad T(n) = T(n-1) + O(1)$



'n' work is done at each level for merging.

$T(n) = \left[T(n-1) + T(n-2) + \cdots T(1) + O(1) \right) \times n$

$= n \times n$

$T(n) = O(n^2)$

lowest higher $= 2$

heighest higher $= n$

$\because$ diff $= n-2 \quad \because (n > 1)$

Ques- Considering for large values of 'n'

(a) $100 < \log\log n < \log n < (\log n)^2 < \sqrt{n} < n < n\log n <$
$\log(n!) < n^2 < 2^n < 4^n < 2^{2^n}$

(b) $1 < \log\log n < \sqrt{\log n} < \log n < \log 2n < 2\log n < n$
$< n\log n < 2n < 4n < \log(n!) < n^2 < n < 2$
$\log 2n < 5n$

(c) $96 < \log_8 n < \log 2n < 5n < n\log_6 n < n\log_2 n < \log(n!)$
$< 8n^2 < 7n^3 < n! < 8^{2n}$