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DAA - Assignment

Tutorial → 1

Ques 1) These are the notations that tells about the complexity of an algorithm.

i) Time complexity : It tells how much time is going to be taken by our algorithm.

ii) Space complexity : It tells how much space is taken by our algorithm in main memory.

Ques 2)

```
for (i=1 to n)
{ i = i*2; }
```

$i \rightarrow 1, 2, 4, 8, 16, 32 \ldots$

$2^0, 2^1, 2^2, 2^3, 2^4, 2^5 \ldots 2^k$

$i > n$

let $i = n$

$2^k = n$

taking log both side

$\log_2 2^k = \log_2 n$

$k = \log_2 n$

$O(\log_2 n)$

Ques 3)

$$T(n) = \begin{cases} 1, & n \le 0 \\ 3T(n-1), & n > 0 \end{cases}$$

$T(n) = 3T(n-1)$

Master theorem for decreasing fun:

$T(n) = aT(n-b) + f(n)$

$f(n) = n^0$

$a > 1 \Rightarrow O(n^0 \cdot 3^n)$

$\Rightarrow O(3^n)$

Ques 4)

$$T(n) \begin{cases} 1, & n <= 0 \\ 2T(n-1), & n > 0 \end{cases}$$

$a = 2, \quad b = 1, \quad f(x) = n^0$

$O(2^n)$

Ques 5)

```
i=1 , s=1
while (s<=n)
  {
    i++;
    s = s+i;
    Pf("1");
  }
```

let $s > n$

$\because s = \frac{K(K+1)}{2}$

$\frac{K(K+1)}{2} > n$

$K^2 > n$

$K = \sqrt{n}$

$\Rightarrow O(\sqrt{n})$

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Ques 5)
```
void function (int n)
{
    int i, count = 0;
    for (i=1; i<=n; i++)
        count++;
}
```

$i^2 <= n$

Let $i^2 >= n$

$i^2 = n$

$i = \sqrt{n}$

$O(\sqrt{n})$

Ques 7)
```
void fun (int n)
{ int i, j, k, count = 0;
    for (i = n/2; i<=n; i++)          ← n
        for (j=1; j<=n; j = j*2)      ← log2 n
            for (k = 1; k<n; k = k*2) ← log2 n
                count ++;
}
```

$O(n \log_2^2 n)$

Ques 8)
```
function (int n)
{
    if (n==1) ⟶ O(1)
        return;
    for (i=1; to n) —— O(n)
    {
        for (j=1 to n) —— O(n)
        {
            Pf("*"); ——— O(n^2)
        }
    }
}
```

function (n-3);
}

$T(n) = T(n-3)$

$a=1 \quad , \quad b=3, \quad f(n) = n^0$

$\Rightarrow O(n)$

Total $= n^2 + n$

$= O(n^2)$

(9)

```
Void func (int n)
{
    for (i=1; i<n; i++)
    {
        for (j=1; j<=n; j=j+i)
            printf("*");
    }
}
```

i	j	
1	1+2 ... n	$\frac{n(n+1)}{2}$
2	1+ ... n	$\frac{n(n+1)}{2}$

$O(n^2)$