Assignment

1)
```
int sum = 0
for (int i=1 ; i<n ; i++) {
    for (int j=1 ; j<i ; j++) {
        sum++;
    }
}
```

→

i	j	sc
1	1	1
2	1,2	1+2
3	1,2,3	1+2+3
⋮	⋮	⋮
n	1,...,n	1+...+n = $\frac{n(n+1)}{2}$

$= \frac{n^2}{2} + n/2$

T.C → $O(n^2)$

optimised.

```
int sum = 0;
for (int i = 0; i<n ; i++) {
    sum = sum + i;
}
```

T.C → $O(n)$

2) $T(n) = 3T(n-1) + 12n$

$\Rightarrow T(1) = 3T(0) + 12$

$\Rightarrow T(1) = 15 + 12 = 27$

$T(2) = 3T(1) + 24$

$= 3 \times 27 + 24$

$= 105$

Q.3 $T(n) = T(n-1) + c$ — (1)

$T(n-1) = T(n-2) + c$

$\Rightarrow T(n) = T(n-2) + 2c$ — (2)

$T(n-2) = T(n-3) + c$

$T(n) = T(n-3) + 3c$ — (3)

} k times

$T(n) = T(n-k) + kc$

$n - k = 1$

$\Rightarrow \boxed{k = n-1}$

$T(n) = T(n-n+1) + (n-1)c$

$T(n) = 1 + nc - c$

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

4) $T(n) = 16T(n/4) + n^2 \log n$

$a = 16, \quad b = 4, \quad p = 1, \quad k = 2$

$b^k = 16$

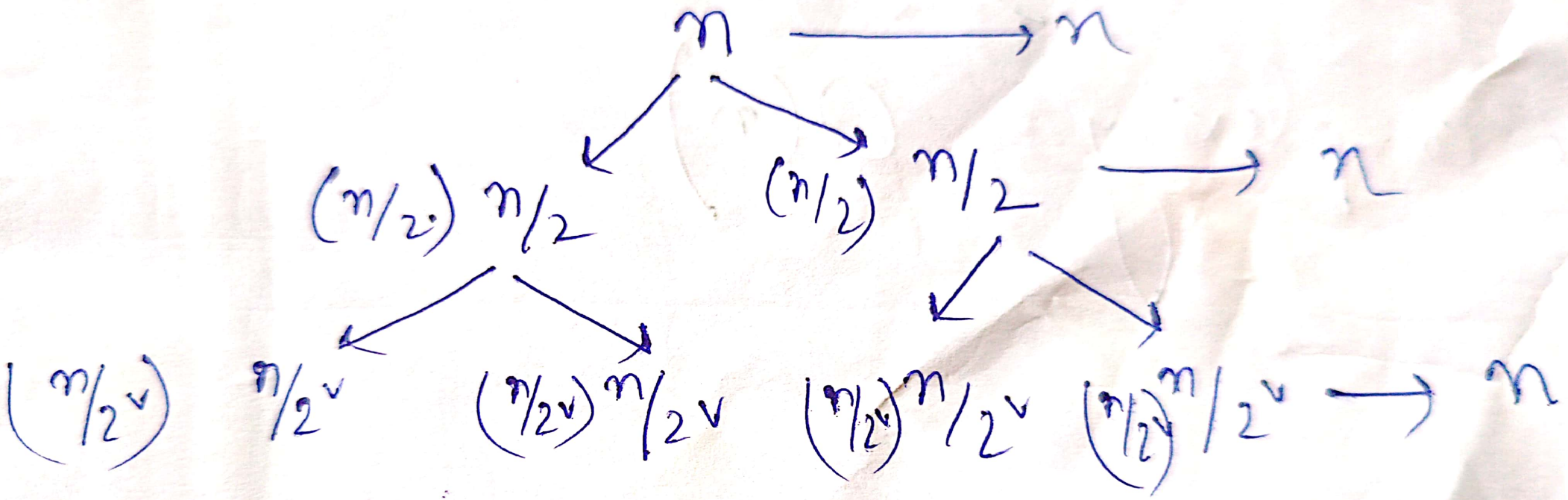
$\boxed{a = b^k}$

$T(n) = O(n^{\log_4^{16}} \log^2 n)$

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

Q.5) $T(n) = 2T(n/2) + n$

$\Rightarrow T(n) = T(n/2) + T(n/2) + n$



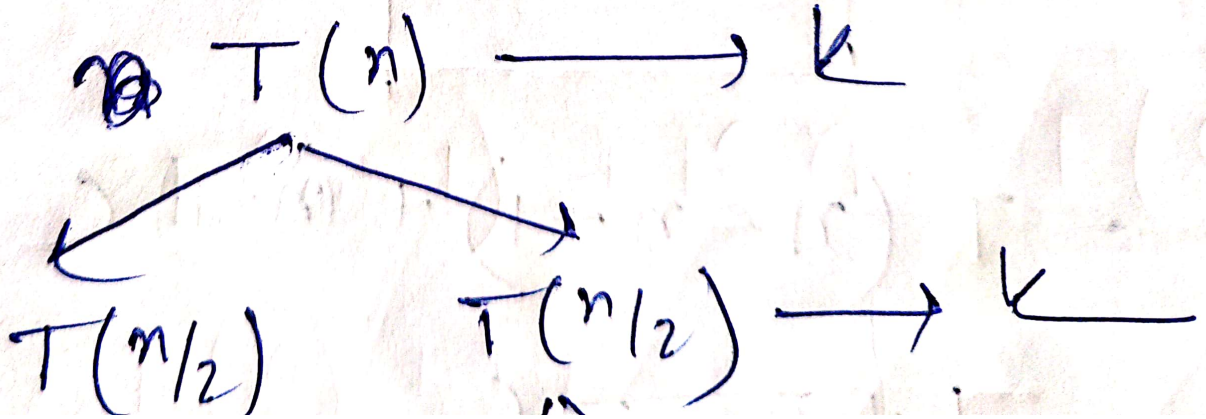
k level

$(n + n + n \text{ ------}) = n \log n$

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

6) $T(n) = 2T(n/2) + k$

$\Rightarrow T(n) = T(n/2) + T(n/2) + k$

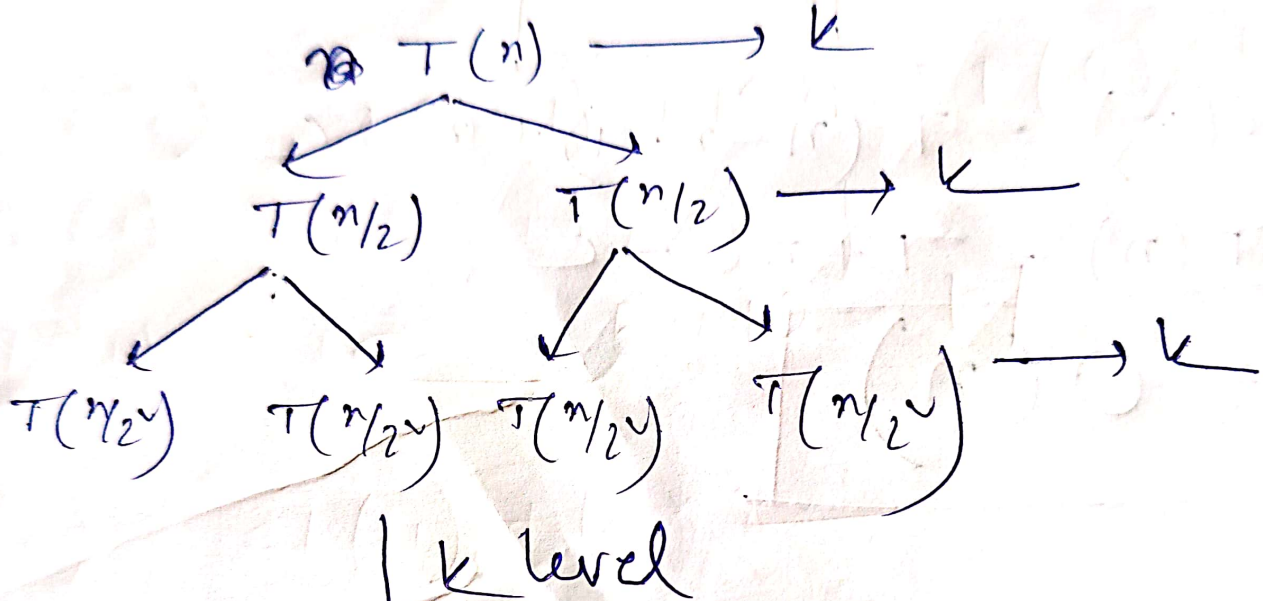


$(n + n + n \text{ ---------- }) = n \log n$

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

6) $T(n) = 2T(n/2) + k$

$\Rightarrow T(n) = T(n/2) + T(n/2) + k$



$\downarrow k$ level

$(k + k + k \text{ ---------- }) = n \log k$

Time Complexity $= O(n)$