Q.1.
Ans:- the time Complexity of the given Code is $O(n^2)$ and we can improve it by using the formula $(n*(n+1))/2$.

Q.2.
Ans. $T(2) = 3T(1) + 12(2)$

$\Rightarrow 3[3T(0) + 12(1)] + 24$

$= 3[3 \times 5 + 12] + 24 \Rightarrow 3[15+12] + 24$

$\Rightarrow 3[27] + 24 \Rightarrow 105$

Q.3.
Ans.

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

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

$$T(n) = T(n-2) + 2c \quad - (2)$$

$$T(n-2) = T(n-2-1) + c$$
$$= T(n-3) + c.$$

$$T(n) = T(n-3) + 3c \quad - (3).$$

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

$n - k = 1$

$n = k+1$

$k = n-1$

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

$\Rightarrow T(1) + nc - c$

Q.4.

Ans. $T(n) = 16\,T\left(\frac{n}{4}\right) + n^2 \log n$

$a = 16$, $b = 4$, $k = 2$, $P = 1$

$a - b^k = 4^2 \Rightarrow 16$

$a = b^k$

$P > -1$

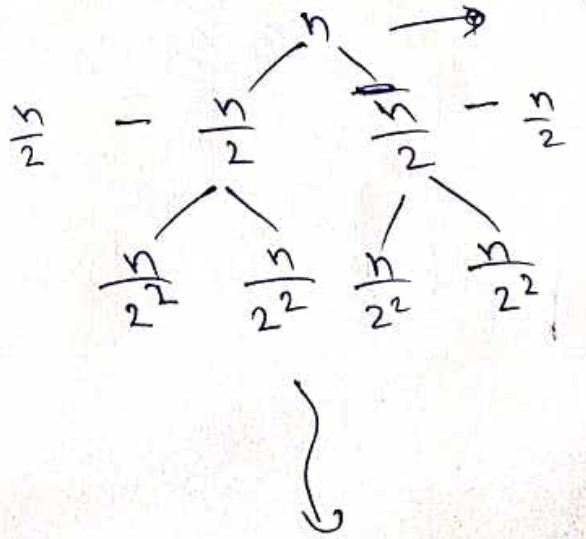
$[\because \log_4 16 = 2]$

$T(n) = \Theta\left(n^{\log_4 16} \log^{1+1} n\right)$

$\Rightarrow \Theta\left(n^2 \log^2 n\right)$

Q.5.

Ans. $T(n) = 2T\left(\frac{n}{2}\right) + n$



$n \Big| - n$

$\Rightarrow \frac{n}{2} + \frac{n}{2} = n$

$-n$

$(n \log n)$

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

$n = 2^k$

$\log n = \log_2 2^k \Rightarrow \log n = k \log_2 2$

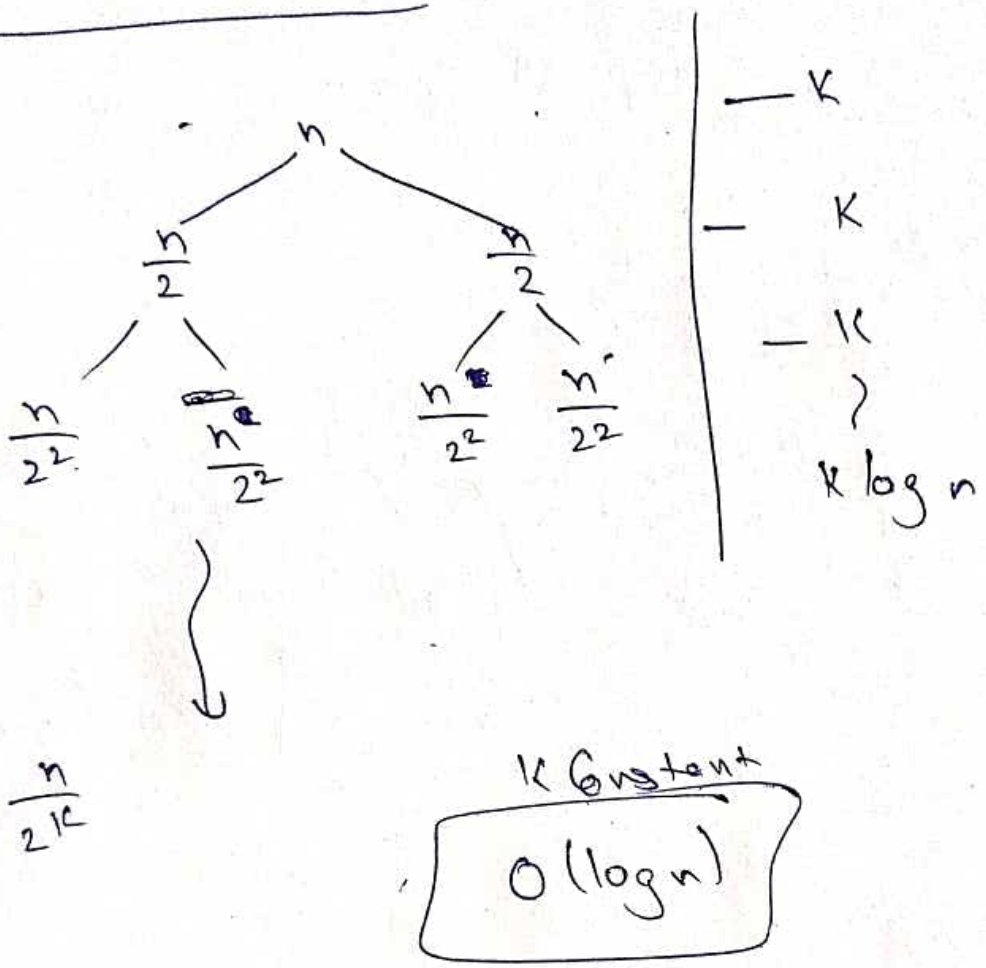
$\Rightarrow \boxed{\log n = k}$

$n + n + n - - - \rightarrow nK$

$n(\log n)$

Q.6.

Ans $T(n) = 2T\left(\frac{n}{2}\right) + K$



K Constant

$O(\log n)$