

Time Complexity Assignment

Assignment 53

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Ques 5] $T(n) = 3T(n/3) + n/2$

Soln.

Here $a=3, b=3, K=1, P=0$.

now $b^K = 3$

$\Rightarrow a = b^K$ and $p > -1$

Hence $T(n) = O(n^{\log_b a} \cdot \log^{(p+1)}(n))$

$= O(n^{\log_3 3} \cdot \log^{(0+1)}(n))$

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

Ans

Ques 6]

$T(n) = 6T(n/3) + n^2 \log n$

Soln.

Here $a=6, b=3, K=2, P=1$

$b^K = 3^2 = 9$

$\Rightarrow a < b^K$ and $p \geq 0$.

Hence, $T(n) = O(n^K \log^p(n))$

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

Ans

Ques 7]

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

Soln.

$T(n) = 4T(n/2) + n \log^{-1}(n)$

$a=4, b=2, K=1, P=-1$

$b^K = 2$

$a > b^K$

Hence, $T(n) = O(n^{\log_b a})$

$= O(n^2)$

Ques 81 $T(n) = 64T\left(\frac{n}{8}\right) - n^2 \log n$

Soln: $a = 64, b = 8, K = 2, p = 1$

$$b^K = 8^2 = 64$$

$$\Rightarrow a = b^K \text{ and } p > -1$$

$$\Rightarrow T(n) = O(n^{\log_b a} \cdot \log^{(p+1)}(n))$$

$$= O(n^{\log_8 64} \cdot \log^{(1+1)}(n))$$

$$= O(n^2 \cdot \log^2(n)) \quad \underline{\text{Ans}}$$

Ques 9 $T(n) = 7T(n/3) + n^2$

$$a = 7, b = 3, K = 2, p = 0$$

$$b^K = 9$$

$$a < b^K, p = 0$$

$$\Rightarrow T(n) = O(n^K \log^p(n))$$

$$= O(n^2) \quad \underline{\text{Ans}}$$

Ques 10 $T(n) = 4T(n/2) + \log n$

$$a = 4, b = 2, K = 0, p = 1$$

$$b^K = 1$$

$$a > b^K$$

$$\Rightarrow T(n) = O(n^{\log_b a})$$

$$= O(n^2) \quad \underline{\text{Ans}}$$