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Class roll no. - 04
Section - A
Univ. roll no. - 2016999 Tutorial 4

Ans1 $T(n) = 3T(n/2) + n^2$

$T(n) = aT(\frac{n}{b}) + f(n)$

$a = 3$, $b = 2$

$c = \log_2 3 = 1.5$

$n^c = n^{1.5}$

$f(n) = n^2$

Since $f(n) > n^c$

$T(n) = \Theta(f(n)) = \Theta(n^2)$

Ans 2 $T(n) = 4T(n/2) + n^2$

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

$a = 4$, $b = 2$

$c = \log_2 4 = 2$

$n^c = n^2$

$f(n) = n^2$

Since $f(n) = n^c$

$T(n) = \Theta(n^c \log n)$

$= \Theta(n^2 \log n)$

Ans(3) $T(n) = T(3n/2) + 2^n$

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

$a = 1, b = 2$

$c = \log_2 1 = 0$

$n^c = n^0 = 1, f(n) = 2^n$

3rd case: $f(n) > n^c$

$T(n) = \theta(f(n)) = \theta(2^n)$

3rd case: $f(n) > n^c$

$T(n) = \theta(f(n)) = \theta(2^n)$

Ans(4) $T(n) = 2^n T(n/2) + n^n$

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

$a = 2^n, b = 2$

$c = \log_2 2^n = n$

$n^c = n^n, f(n) = n^{2n}$

$f(n) = n^c$

$T(n) = \theta(n^c \log n)$

$T(n) = \theta(n^n \log n)$

Ans 5

$T(n) = 16T(n/4) + n$

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

$a = 16,\ b = 4$

$c = \log_4 16 = 2$

$n^c = n^2,\ f(n) = n$

$f(n) < n^c$

$T(n) = \Theta(n^c)$

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

Ans 6

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

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

$a = 2,\ b = 2$

$c = \log_2 2 = 1$

$n^c = n,\ f(n) = n \log n$

$f(n) > n^c$

$T(n) = \Theta(f(n))$

$T(n) = \Theta(n \log n)$

7. $T(n) = 2T(n/2) + n/\log n$

$a = 2, b = 2$

$c \rightarrow \log_2 2 = 1$

$n^c \rightarrow n^1, f(n) = n/\log n$

$n^c > f(n)$

$T(n) = \Theta(n^c)$

$T(n) = \Theta(n)$

8. $T(n) = 2T(n/4) + n^{0.5}$

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

$a = 2, b = 4$

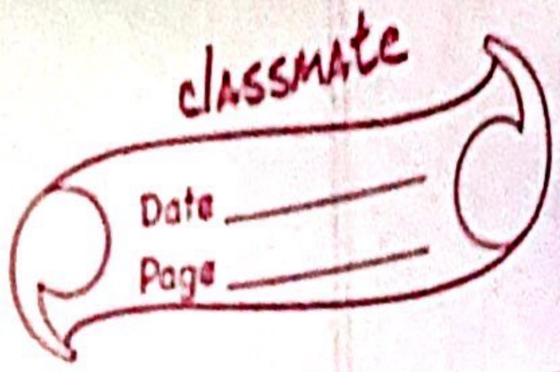
$c = \log_4 2 = 0.5$

$n^c = n^{0.5}, f(n) = n^{0.5}$

$f(n) > n^c$

$T(n) = \Theta(f(n))$

$T(n) = \Theta(n^{0.5})$



9) $T(n) = 0.5\,T(n/2) + 1/n$

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

$a = 0.5, b = 2$

$c = \log_2 0.5 = -1$

$n^c = n^{-1} = 1/n$, $f(n) = 1/n$

$f(n) = n^c$

$T(n) = \theta(n^c \log n)$

$= \theta(\log n / n)$

10) $T(n) = 16T(n/4) + n!$

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

$a = 16, b = 4$

$c = \log_4 16 = 2$

$n^c = n^2$, $f(n) = n!$

$f(n) > n^c$

$T(n) = \theta(f(n))$

$T(n) = \theta(n!)$

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

$a = 4, b = 2$

$c = \log_2 4 = 2$

$n^c = n^2$, $f(n) = \log n$

$f(n) < n^c$

$T(n) = \theta(n^c)$

$f(n) = \theta(n^2)$

Ans 12. $T(n) = \sqrt{n}\, T(n/2) + \log n$

$T(n) = a\, T(n/b) + f(n)$

$a = 2^{1/2}, b = 2, f(n) = \log n$

$c = \log_2 2^{1/2} = \frac{1}{2} \log n$

$n^c = n^{\frac{1}{2} \log n}$

$f(n) \in n^c$

$\therefore T(n) = \theta(n^c)$

Ans 13. $T(n) = 3T(n/2) + n$

$a = 3, \quad b = 2$

$c = \log_2 3 = 1.58$

$n^c = n^{1.58}, \quad f(n) = n$

$f(n) < n^c$

$T(n) = \theta(n^c)$

$T(n) = \theta(n^{1.58})$