Tutorial 4 :-

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

(1.) $T(n) = 3T(n/2) + n^2$

$f(n) = n^2$.

$n^{\log_b a} = n^{\log_2 3}$

$n^{\log_2 3} < n^2$

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

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

$n^{\log_2 4} = n^2$

$n^2 = f(n)$

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

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

$n^{\log_2 1} = n^0 = 1$

$1 < 2^n$

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

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

master's theorem is not applicable.

Q5: ~~fo~~ $T(n) = 16T(n/4) + n$

$n^{\log_4 16} = n^2$

$n^2 > f(n) = T(n) = n^2$

Q6: $T(n) = 2T(n/2) + n\log n$

$n^{\log_2 2} = n$

$n < f(n)$

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

Q7: $T(n) = 2(T(n/2) + \frac{n}{\log n}$

$n^{\log}$

Q8 $T(n) = 2T(n/4) + n^{0.51}$

$a = 2$, $b = 4$, $f(n) = n^{0.51}$

$n^{\log_2 4} = n^2$

$n^2 > n^{0.51}$

$\theta(n^{0.51})$.

Q 9:- $T(n) = 0.5 + T(n/2) + \frac{1}{n}$

Theorem

Master's ↑ not applicable

Q 10:- $T(n) = 16\,T(n/4) + n!$

$n^{\log_4 16} = n^2$

$n^2 < n!$

$T(n!)$.

Q 11:- $T(n) = 4\,T(n/2) + \log n$

$a = 4,\ b = 2,\ f(n) = \log n$

$n^{\log_b a} = n^2$

$n^2 > f(n)$

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

Q 12:- $T(n) = \text{sqrt}(n) + T(n/2) + \log n$

Master's Theorem is not applicable.

Q 13:- $T(n) = 3\,T(n/2) + n$

$a = 3,\ b = 2,\ f(n) = n$

$n^{\log_b a} = n^{\log_2 3} = n^{1.58}$

$n^{1.58} > f(n)$

$T(n) = \theta(n^{\log_2 3})$

Q 14:- $T(n) = 3\,T(n/3) + \sqrt{n}$

Q 15

Q 16:- $T(n) = 3\,T(n/4) + n \log n$

$n^{\log_4 3} = n^{0.79}$

$n^{0.79} < n \log n$

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

Q 17:- $T(n) = 16\,T(n/3) + n \log n$

$a = 6,\ b = 3,\ f(n) = n^2 \log n$

$n^{\log_3 6} = n^{1.63}$

$n^{1.63} < n^2 \log n$

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

Q17 : $T(n) = 3T(n/3) + n/2$

$a = 3, b = 3, f(n) = n/2$

$n^{\log_3 3} = n$

$n > n/2$

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

Q19 : $T(n) = 4T(n/2) + n \log n$

Q20 : $T(n) = 64T(n/8) - n^2 \log n$.

~~Master Master's Theorem is not applicable~~ –

Q21 : $T(n) = 7T(n/3) + n^2$

$n^{\log_3 7} = n^{1.7}$

$n^{1.7} < n^2$

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

Q22 : $T(n) = T(n/2) + n(2 - \cos n)$