(Tutorial – 4)

(Master Theorem)

(1) $T(n) = 3T(\frac{n}{2}) + n^2$

$a = 3, \quad b = 2, \quad c = 2$

$\log_b^a = \log_2^3 < 2$

here, $c > \log_b^a$

$\therefore \quad TC = \Theta(g(n)) = \Theta(n^2)$

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

(2) $T(n) = 4T(\frac{n}{2}) + n^2$

$a = 4, \quad b = 2, \quad c = 2$

$\log_b^a = \log_2^4 = 2 = c$

$\therefore TC = \Theta(n^c \log_b^a) = \Theta(n^2 \log n)$

(3) $T(n) = T(\frac{n}{2}) + 2^n$

$T(n) = \Theta(2^n)$ (case 3)

(4) $T(n) = 2^n T(\frac{n}{2}) + n^3$

Does not apply since a is not a constant

(5) $T(n) = 16T(\frac{n}{4}) + n$

$T(n) = \Theta(n^2)$ (case 1)

(6) $T(n) = 2T(\frac{n}{2}) + n \log n$

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

(7) $T(n) = 2T(\frac{n}{2}) + \frac{n}{\log n}$

(Does not apply)

(8) $T(n) = 2T(\frac{n}{4}) + n^{0.51}$

$T(n) = \Theta(n^{0.51})$ (case 3)

(9) $T(n) = 0.5T(\frac{n}{2}) + \frac{1}{n}$

(Does not apply)

(10) $T(n) = 16T(\frac{n}{4}) + n!$

$T(n) = \Theta(n!)$ (case 3)

(11) $T(n) = 4T(\frac{n}{2}) + \log n$

$T(n) = \Theta(n^2)$ (case 1)

(12) $T(n) = \text{sqrt}(n)\,T(\frac{n}{2}) + \log n$

(Does not apply)

(13) $T(n) = 3T(\frac{n}{2}) + n$

$T(n) = \Theta(n^{\log 3})$ (case 1)

(14) $T(n) = 3T(\frac{n}{3}) + \text{sqrt}(n)$

$T(n) = \Theta(n)$ (case 1)

(15) $T(n) = 4T(\frac{n}{2}) + cn$

$T(n) = \Theta(n^2)$ (case 1)

(16) $T(n) = 3T(\frac{n}{4}) + n \log n$

$T(n) = \Theta(n \log n)$ (case 3)

(17) $T(n) = 3T(\frac{n}{3}) + \frac{n}{2}$

$T(n) = \Theta(n \log n)$ (case 2)

(18) $T(n) = 6T(\frac{n}{3}) + n^2 \log n$

$T(n) = \Theta(n^2 \log n)$ (case 3)

(19) $T(n) = 4T(\frac{n}{2}) + n/\log n$

$T(n) = \Theta(n^2)$ (case 1)

(20) $T(n) = 64T(\frac{n}{8}) - n^2 \log n$.

(Does not apply)

(21) $T(n) = 7T(\frac{n}{3}) + n^2$

$T(n) = \Theta(n^2)$ (case 3)

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

(Does not apply)