```
Tutavial No-4
```

Ques-1. T(m) = 3T (m/2)+m2 $\frac{60l}{100}$ $T(n) = aT(m/b) + f(m^2)$ az1, b21 on comparing $A=3, b=2, f(n)=n^2$ Now, c= log b a = log2 3 = 1.584

 $m^2 = m^{1.534} < m^2$... $f(n) > m^2$

:. $T(n) = O(n^2)$

Quera. T(n) = 4T(n/2) + m2.

ay1, b>1

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

 $C = \log_2 4 = 2$

 $m^{c} = m^{2} = f(m) = m^{2}$

 $ooldsymbol{.} ooldsymbol{.} ooldsymbol{.}$

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

b=2 $f(n)=2^{n}.$

 $c = \omega g_b \alpha = \omega g_2 c = 0$

 $m^{c}=m^{b}=4$

f(n) >m2

 $\rightarrow 7 (m) = 0(2^n)$

dues 4.
$$T(m) = 2^m T(m/2) + m^2$$

$$0 = 2^n$$

$$b = 2, f(n) = m^2$$

$$c = \log_2 2^n$$

$$= m$$

$$f(n) = m^c$$

$$f(n) = 0 (m^2 \log_2 m)$$
duess $T(m) = 16T(m/4) + n$

$$0 = 16, b = 4$$

$$f(n) = m$$

$$c = \log_4 16 = \log_4 (4)^2 = 2\log_4 4$$

$$= 2$$

$$f(n) < m^c$$

$$T(n) = 0 (n^2)$$
duestion 6. $T(m) = 2T(m/2) + m\log_2 m$

Question a = 2, b = 2 f(m) = nlog n. $c = log_2 2 = 1$ m' = m' = n mlog n > m $f(m) > m^c$

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

```
Quest. T(m) = 2T(m/2) + m/\log m.

a = 2, b = 2, f(m) = h/\log n.

c = \log_2 2 = 1.

n^c = m^1 = m.

n \leq m.

\log m.

\log m.

T(m) = O(m).
```

dust $T(n) = 2t (m/4) + m^{0.51}$ $a = 2, b = 4, f(m) = m^{0.51}$ $c = log_b a = log_4 2 = 0.5$ $m^c = n^{0.5}$ $n^{0.5} < n^{0.51}$ $f(n) > n^c$ $T(m) = 0 (n^{0.51})$

Dues 9. T(m)=0.5T(m/2)+1/m. a=0.5, b=2 $a\ge 1$ but here a is 0.5 So we of can't apply marter's Theorem.

Questo T(n) = 16T(n/4) + m/4 a = 16, b = 4, f(n) = n/4 c = 16, c = 16,

```
Dues 7. T(m) = 2T(m/2) + m/\log m.

a = 2, b = 2, f(m) = m/\log n

c = \log_2 2 = 1

m^c = m^1 = m.

m \leq m

\log m

\log m

\log m

m \leq m \leq m
```

dusb. $T(n) = 2t (m/4) + n^{0.51}$. $a = 2, b = 4, f(m) = n^{0.51}$. $c = log_{b}a = log_{4}2 = 0.5$. $n^{c} = n^{0.5}$. $n^{0.5} < n^{0.51}$. $f(n) > n^{c}$. $T(n) = 0 (n^{0.51})$.

Dues 9, T(m)=0.5T(m/2)+1/m. a=0.5, b=2 $a\ge 1$ but here a 15 0.5 So we 9 can't apply marter's Theorem

Questo T(n) = 16T(n/4) + m/4 a = 16, b = 4, f(n) = n/4 c = 16, c = 16 c = 16

Dues 11 4T (m/2) + log m. a = 4, b = 2, f(m) = log m. c = log a = log 24 = 2 $m^c = m^2$ f(m) = log m. f(m) = log m. $f(m) < m^c$ $f(m) < m^c$ $T(m) = 0 (m^c)$ $= 0 (m^c)$

dues Let T(m) = 8grt(m)t'(n/2) + log m $a = \sqrt{m}$, b = 2 $c = log_b a = log_2 \sqrt{m} = 1/2 log_2 m$ $o^3 = \frac{1}{2} log_2 m < log m$ $o^3 = f(m) > m^c$ $f(m) = 8 (m^{1.5} 649)$

Quests T(m) = 3T(n/2) + m. a = 3; b = 2 f(m) = m. $c = \log_b a = \log_2 3 = 1.5849$. $m^c = m^{1.5}849$ $m < m^{1.5}849$ $f(m) < m^c$ $f(m) = 0 (m^{1.5}849)$ Dues 11 4T (m/2) + log m. a = 4, b = 2, f(m) = log m. $c = log_b a = log_2 4 = 2$ $m^c = m^2$ f(m) = log m. f(m) = log m. $f(m) < m^c$ $f(m) < m^c$ $T(m) = 0 (m^c)$ $= 0 (m^c)$

Dues 18 T(m) = 19 grt (m) + (n/2) + Log m $a = \sqrt{m}$, b = 2 $c = \log_{2} m = \log_{2} \sqrt{m} = 1/2 \log_{2} m$ ° $\frac{1}{2} \log_{2} m < \log_{2} m$ ° $f(n) > m^{c}$ $T(m) = 8 (m^{1.5} 849)$

 $\frac{\partial u_{1}19}{\partial u_{2}19} + \tau(m) = 3T(m/2) + m.$ $a = 3; b = 2 \qquad f(m) = m.$ $c = \log_{1} a = \log_{2} 3 = 1.5849.$ $m^{c} = m^{1.5849}$ $m < m^{1.5849}$ $f(m) < m^{c}$ $T(m) = 0 (m^{1.5849})$

Questy T(n) = 3T(n/3) + 8qrt(n) 0 = 3, b = 3 $c = log_b a = log_g 3 = 1$ $n^c = n^d = n$ As sqrt(n) < n. $f(n) < n^c$ T(n) = 0(n).

Quests T(m) = 4T(m/2) + m. a = 4 b = 2 $C = log_b a = log_2 4 = 2$ $m^c = m^2$ $m < m^2$ (for any constant f(m) < m^2 $f(m) = 0 (m^2$

Ques 16 $T(m) = 3T(m/4) + m \log m$. a = 3, b = 4, $f(m) = m \log m$. $c = \log_b a = \log_4 3 = 0.792$ $m^c = m^{0.792}$ $m^{0.792} \langle m \log m \rangle$ $T(m) = 0 (m \log m)$

Due 14
$$T(n) = 3T(n/3) + 19rt(n)$$

 $\alpha = 3, b = 3$
 $c = 109_{b}\alpha = 109_{3} = 1$
 $n^{c} = n^{d} = n$
As $19rt(n) < n$
 $19rt(n) < n$
 $19rt(n) < n$
 $19rt(n) < n$

Quest 5
$$T(m) = 4T(m/2) + m$$
.
 $a = 4$ $b = 2$
 $C = log_b a = log_2 4 = 2$
 $m^c = m^2$.
 $m < m^2$ (for any constant f(m) < m^2 .
 $f(m) = 0 (m^2$.

Ques 16
$$T(m) = 3T(m/4) + m \log m$$
.
 $a = 3$, $b = 4$, $f(m) = m \log m$.
 $c = \log_b a = \log_4 3 = 0.792$
 $m^c = m^{0.792}$
 $m^{0.792}$
 $m^{0.792}$
 $m \log m$.
 $T(m) = 0 (m \log m)$

Ques 17
$$T(n) = 3T(n/3) + n/2$$

 $a = 3$; $b = 3$
 $c = log_b a = log_3 = 1$
 $f(n) = n/2$
 $n^c = n^1 = n$
As $n/2 \times n$
 $f(n) \times n^c$
 $\delta \circ T(n) = \theta(n)$

Dues 18.
$$T(m) = 6t (m/3) + m^2 log m$$

$$a = 6 ; b = 3$$

$$c = log s a = log s b = 1.6309$$

$$m^2 = m^{1.6309}$$
As $m^{1.6309} \angle m^2 log m$

$$i. T(m) = 0 (m^2 log m)$$

Ines 19
$$T(n) = 4T(n/2) + m \log n$$

 $\alpha = 4$, $b = 2$, $f(n) = n/\log n$.
 $c = \log_b n = \log_2 4 = 2$
 $n^c = n^2$
 $\frac{n}{\log n} \neq n^2$
 $togn$
 $t(n) = \theta(n^2)$

Show 20
$$T(m) = 6u + (m/8) - n^2 \log m$$
.
 $a = 6y \quad b = 8$
 $c = \log_6 6u \Rightarrow \log_8 (8)^2$
 $c = 8$.
 $m^c = m^2$.
 $m^2 \log_7 x \Rightarrow m^2$
 $T(m) = 0 (m^2 \log_7 m)$

Quei 21
$$T(m) = 7T(m/3)+m^2$$

 $a = 7$; $b = 3$; $f(m) = m^2$
 $c = log_b a = log_3 = 1.7712$
 $m^c = m^{l_1 + 7/2}$
 $m^{l_1 + 7/2} < m^2$.
 $T(m) = 0 (m^2)$

Quest
$$T(m) = T(m/2) + m(R - cos m)$$

$$a = 1, b = R$$

$$c = log_b a = log_2 | = 0$$

$$n^c = n^c = 1$$

$$n(R - cos m) > n^c$$

$$T(m) = 0 (m(2 - cos m))$$