Subject : .... Date: / /

[3] Estimate The big O for T(n)

a- $T(n) \begin{cases} 1 & n=0 \\ 3T(n-1)+n & n>0 \end{cases}$

Method → using Master theorom (Decreasing Function)

$T(n) = aT(n-b) + f(n)$ → form

<u>where</u> $a>0$

$b>0$

$f(n) = O(n^k)$ where $k \geq 0$

$\because T(n) = 3T(n-1) + n \begin{cases} a=3 \\ b=1 \\ k=1 \end{cases}$

$\because a>1 \rightarrow O(a^{n/b}\, n^k) \rightarrow \boxed{O(3^n * n)}$

b- $T(n) \begin{cases} 1 & n=1 \\ T(n/2)+1 & n>1 \end{cases}$

Method → using Master Thearom (dividing funetions)

$T(n) = aT(n/b) + f(n)$ → <u>where</u> $a \geq 1$, $b>1$

$f(n) = O(n^k \log^p n)$

$\because T(n) = T(n/2) + 1 \rightarrow a=1 \quad k=0$

$b=2 \quad p=0$

$\log_b^a = \log_2^1 = 0 \therefore \log_b^a = k \rightarrow \because p=0 > -1$

$\therefore O(n^k \log^{p+1} n) = \boxed{O(\log n)}$