(d)

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

$T(n)$ — n — $n/\lg n$

$n/2 \quad n/2$ — $2\left[(n/2)/\lg(n/2)\right]$

$n/2^2 \quad n/2^2$ $\quad \vdots$

$T(1)$ — $n/2^k$ — $2^k\left[(n/2^k)/\lg(n/2^k)\right]$

* As, $T(1) = T(n/2^k)$

$$1 = n/2^k$$
$$2^k = n$$
$$k = \log_2 n$$

* $= n/\lg n + 2\,\dfrac{n/2}{\lg(n/2)} + \cdots + 2^k\,\dfrac{n/2^k}{\lg(n/2^k)}$

$= n/\lg n + n/\lg(n/2) + \dots + n/\lg(n/2^k)$

$= n\left(1/\lg n + 1/\lg(n/2) + \dots + 1/\lg(n/2^k)\right)$

$= n\left(1/\lg n - 1 + 1/\lg(n/2)2 + \dots + 1/\lg(n) - 2^k\right)$

$\therefore$ Harmonic Series $\therefore a_n = \dfrac{1}{a_1 + (n-1)d}$

$= n\left(\dfrac{1}{\frac{1}{\lg n - 2} - \frac{1}{\lg n - 1}}\right) \Rightarrow n\left(\dfrac{1}{\frac{\lg n - 1 - \lg n + 2}{(\lg n - 2)(\lg n - 1)}}\right)$

$= n\left(\dfrac{1}{\frac{1}{\lg(\lg n)}}\right) \Rightarrow n(\lg(\lg n))$

$\therefore$ Big O $= O(n \lg(\lg n))$