4.

$$T(n) = 19 \sum_{i=1}^{n} i^2 \cdot \log_3 n$$

$$= 19 \log_3 n \sum_{i=1}^{n} i^2$$

$$= 19 \log_3 n \left(\frac{n(n+1)(2n+1)}{6} \right)$$

$$= 19 \log_3 n \left(\frac{n(n+1)(2n+1)}{6} \right) \quad -n3$$

$$= 19 \log_3 n \left(\frac{n(n^2+2n+1)}{6} \right)$$

$$= 19 \log_3 n \left(\frac{n^3+2n^2+n}{6} \right)$$

$$\therefore \quad O(\log_3 n \; n^3)$$