Q2.

A) $T(n) = 4T\left(\frac{n}{4}\right) + 1000n$

$\log_b a = \log_4 4 = 1$

Case 2: $f(n) = 1000n = \Theta(n^{\log_b a}) = \Theta(n^1)$

$\therefore \Theta(n \log n)$

B) $T(n) = 2T\left(\frac{n}{4}\right) + n^{0.4}$

$\log_b a = \log_4 2 = 0.5$

Case 1: $f(n) = n^{0.4} = O(n^{\log_b a - \varepsilon}) = O(n^{0.5 - \varepsilon})$

Where $\varepsilon = 0.1$ $\therefore O(\sqrt{n})$