

Assignment Week - 2

Masteri Theorem

$$① \quad T(n) = 8T\left(\frac{n}{2}\right) + 1000n^2$$

$$f(n) = c \times n^d$$

$$\Rightarrow d = 2$$

$$a = 8$$

$$b = 2$$

$$b^d = 2^2 = 4$$

$$\therefore a > b^d$$

$$\cancel{T(n) \in \Theta(n^d \log_b a)}$$

$$\cancel{= \Theta(n^2 \log_2 8)}$$

$$\cancel{= \Theta(n^2 \cdot 3)}$$

$$\cancel{= \Theta(n^2 \log 3)}$$

∴

$$T(n) \in \Theta(n^{\log_b a})$$

$$= \Theta(n^{\log_2 8})$$

$$= \Theta(n^3)$$

②

$$T(n) = 2T(n/2) + n^2$$

$$d = 2$$

$$a = 2$$

$$b = 2$$

$$b^d = 4$$

$$\therefore a < b^d$$

$$\begin{aligned} T(n) &\in \theta(n^d) \\ &= \theta(n^2) \end{aligned}$$

③

$$T(n) = 2T(n/2) + 10n$$

$$f(n) = 10n$$

$$d = 1$$

$$a = 2$$

$$b = 2$$

$$b^d = 2$$

$$\therefore a = b^d$$

$$\begin{aligned} T(n) &\in \theta(n^d \log n) \\ &= \theta(n \log n) \end{aligned}$$