SIN(R) - Assignment - 3

Theory (2)

2) (a) Latency = α

No. of element = k

BBW of transfer = β

So time required to transfer k element

$$T_k = \frac{k}{\beta}$$

So total time for transfer = $\alpha + \frac{k}{\beta}$

As k elements transfered, no. of iteration can be done is k.

But no. of update = $\sum_{i=1}^{k-1} i$

So total time for update = $X \sum_{i=1}^{k-1} i = X \cdot \frac{k(k-1)}{2}$

So total time for k iteration

$$= \alpha + \frac{k}{\beta} + \frac{k(k-1)}{2} X$$

Hence parallel overhead / process / iteration

$$= \frac{1}{k}\left(\alpha + \frac{k}{\beta} + X \cdot \frac{k(k-1)}{2}\right)$$

(Ans).

$$T_{tot} = \frac{\alpha}{k} + \frac{X(k-1)}{2} + \frac{1}{\beta} \text{ (Ans)}.$$

2) (b) $T_{tot} = \frac{\alpha}{k} + \frac{\lambda(k-1)}{2} + \frac{1}{\beta}$.

$\therefore \frac{dT_{tot}}{dk} = -\frac{\alpha}{k^2} + \frac{\lambda}{2} = 0$ [to find min of T_{tot} for best k]

$\therefore k = \sqrt{\frac{2\alpha}{\lambda}}$

So for $\alpha = 2$ ms, $\lambda = 0.2$ ms.

$k = \sqrt{\frac{4}{0.2}} = \sqrt{20} \approx 4.472$

Let's take $k = 5$.

So $T_{tot} = \frac{2}{5} + \frac{0.2 \times 4}{2} + \frac{1}{30}$

$= 0.4 + 0.4 + 0.0333$

≈ 0.833 ms

So Ans: best value of $k = 5$, $T_{tot} = 0.833$ ms

(Ans)