

p79⁵
RJC

Computer Systems Modelling 2004

[Operational analysis]

(a) Little's law :

$$M = X \cdot (\text{mean residence time})$$

$$= X \cdot (R + Z)$$

$$\therefore \frac{M}{X} = R + Z$$

$$R = \frac{M}{X} - Z$$

(b) ~~(i)~~ Service demands, $D_i = V_i S_i$

(i) $D_{CPU} = 25 \cdot (0.04) = 1$

$$D_A = 20 \cdot (0.03) = 0.6$$

$$D_B = 4 \cdot (0.025) = 0.1$$

(ii) Utilization law at each device

$$U_i = X_i S_i = X V_i S_i = X D_i$$

$$\text{So, } X = U_A / D_A = 0.6 / 0.6 = 1$$

$$\therefore U_{CPU} = X D_{CPU} = 1 \cdot (1) = 100\%$$

$$U_B = X D_B = 1 \cdot (0.1) = 10\%$$

$$(ii) \quad U_B = 0.1 = 10\%$$

$$U_B = X D_B \Rightarrow X = 1$$

$$\begin{aligned} \therefore R &= \frac{M}{X} - Z \quad (\text{interactive response} \\ &\quad \text{time law}) \\ &= \frac{20}{1} - 5 = 15 \text{ seconds} \end{aligned}$$