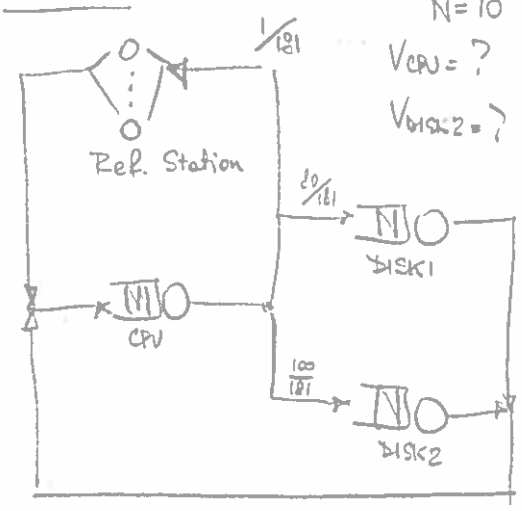
ESE 3.1



N = 10

$V_{CPU} = ?$ $V_{DISK1} = ?$

$V_{DISK2} = ?$

$$\begin{cases} V_{CPU} = V_2 + V_{DISK1} + V_{DISK2} \\ V_{DISK1} = \frac{80}{181} V_{CPU} \\ V_{DISK2} = \frac{100}{181} V_{CPU} \\ V_2 = V_{REF} = 1 \end{cases}$$

$$\begin{cases} V_{CPU} = 1 + \frac{80}{181} V_{CPU} + \frac{100}{181} V_{CPU} \rightarrow V_{CPU} = 181 \\ V_{DISK1} = 80 \\ V_{DISK2} = 100 \\ V_2 = 1 \end{cases}$$

ESE 3.2

1) $P_{12} = \frac{2}{3}$ $P_{13} = \frac{1}{3}$, $V_i = ?$

See A1)

$$\begin{cases} V_1 = \frac{\lambda_1}{\lambda} = \frac{3}{5} \\ V_2 = \frac{\lambda_2}{\lambda} = \frac{6}{5} \\ V_3 = \frac{\lambda_3}{\lambda} = \frac{7}{10} \\ V_4 = \frac{\lambda_4}{\lambda} = \frac{1}{2} \end{cases}$$

2) $U_2 = U_3$, $P_{12} = ?$ $P_{13} = ?$

See A2)

A1)

$$\begin{cases} V_0 = 1 \\ V_1 = \frac{3}{5} V_0 \\ V_2 = \frac{3}{10} V_0 + \frac{2}{3} V_1 + \frac{1}{5} V_4 \\ V_3 = \frac{1}{10} V_0 + \frac{1}{3} V_1 + \frac{4}{5} V_4 \\ V_4 = \frac{1}{3} V_2 + \frac{1}{3} V_3 \end{cases}$$

$$\begin{cases} V_0 = 1 \\ V_1 = \frac{3}{5} \\ V_2 = \frac{3}{10} + \frac{2}{3} \cdot \frac{3}{5} + \frac{1}{5} V_4 \\ V_3 = \frac{1}{10} + \frac{1}{3} \cdot \frac{3}{5} + \frac{4}{5} V_4 \\ V_4 = \frac{1}{3} V_2 + \frac{1}{3} V_3 \end{cases}$$

A2)

$$U_k = X \cdot D_k = X \cdot v_k \cdot S_k$$

$$U_2 = U_3 \quad X \cdot v_2 \cdot S_2 = X \cdot v_3 \cdot S_3$$

$$v_2 \cdot \frac{1}{18} = v_3 \cdot \frac{1}{30} \qquad \frac{v_2}{v_3} = \frac{18}{30} = \frac{3}{5}$$

$$P_{13} = \alpha \qquad P_{23} = 1 - \alpha$$

$$\begin{cases} v_0 = 1 \\ v_1 = \frac{2}{5} v_0 \\ v_2 = \frac{3}{10} v_0 + \alpha v_1 + \frac{1}{5} v_4 \end{cases}$$

$$v_3 = \frac{1}{10} v_0 + (1-\alpha) v_1 + \frac{4}{5} v_4$$

$$v_4 = \frac{1}{3} v_2 + \frac{1}{3} v_3$$

$$v_2 = \frac{3}{5} v_3$$

$$3\left(\frac{2}{5} + \frac{3}{5}\alpha\right) = 3\left(\frac{1+6+2}{10} - \frac{3}{5}\alpha\right)$$

$$2 + 3\alpha = \frac{27}{10} - \frac{9}{5}\alpha$$

$$\left(3 + \frac{9}{5}\right)\alpha = \frac{27}{10} - \frac{20}{10}$$

$$\frac{24}{5}\alpha = \frac{7}{10} \qquad \alpha = \frac{7}{10} \cdot \frac{5}{24} = \frac{7}{48}$$

ESE 3.3

See B)

$$\begin{cases} v_1 = \frac{\lambda_1}{\lambda} = \frac{a}{1-b} \\ v_2 = \frac{\lambda_2}{\lambda} = \frac{1-a}{1-b} \end{cases}$$

2) $X_1 = \lambda_1 (1-b) = \lambda a$

$X_2 = \lambda_2 (1-b) = (1-a)\lambda$

ESE 3.4

See C)

$$\begin{cases} v_1 = \frac{a}{1-b} \\ v_2 = \frac{1-a}{1-b} \\ v_3 = \frac{1}{1-b} \end{cases}$$

ESE 3.5

See D)

$$\begin{cases} v_1 = 2 \\ v_2 = 0.92 \\ v_3 = 0.4 \end{cases}$$

2) $X_i = X \cdot v_i = \begin{cases} X_1 = 20 \text{ j/s} \\ X_2 = 9.2 \text{ j/s} \\ X_3 = 4 \text{ j/s} \end{cases}$

3) $D_i = v_i \cdot S_i = \begin{cases} D_1 = 0.08 \text{ s} \\ D_2 = 0.092 \text{ s} \\ D_3 = 0.048 \text{ s} \end{cases} \rightarrow U_i = X D_i = \lambda D_i = \begin{cases} U_1 = 0.8 \\ U_2 = 0.92 \\ U_3 = 0.48 \end{cases}$

ESE 3.6

Not done in this course

B)

$$\begin{cases} v_0 = 1 \\ v_1 = av_0 + bv_1 \\ v_2 = (1-a)v_0 + bv_2 \end{cases}$$

C)

$$\begin{cases} v_0 = 1 \\ v_1 = a(v_0 + bv_3) \\ v_2 = (1-a)(v_0 + bv_3) \\ v_3 = v_1 + v_2 \end{cases}$$

D)

$$\begin{cases} v_0 = 1 \\ v_1 = v_0 + v_2 + 0.2v_3 \\ v_2 = 0.3v_1 + 0.8v_3 \\ v_3 = 0.2v_1 \end{cases} \qquad \begin{cases} v_0 = 1 \\ v_1 = 1 + 0.3v_1 + 0.16v_1 + 0.04v_1 \\ v_2 = 0.3v_1 + 0.16v_1 \\ v_3 = 0.2v_1 \end{cases}$$

1) $\begin{cases} V_1 = 0.6\,V_2 \\ V_2 = 0.4\,V_2 \\ V_2 = V_2 \\ V_2 = 1 \end{cases}$ $\begin{cases} V_1 = 0.6 \\ V_2 = 0.4 \\ V_3 = 0.4 \\ V_2 = 1 \end{cases}$

2) $\begin{cases} D_1 = V_1 \cdot S_1 = 0.6 \cdot 20\,s = 12\,s \\ D_2 = V_2 \cdot S_2 = 0.4 \cdot 10\,s = 4\,s \\ D_3 = V_3 \cdot S_3 = 0.4 \cdot 15\,s = 6\,s \end{cases}$

ESE 3.8

1) $\begin{cases} V_1 = V_2 \\ V_2 = 0.9\,V_1 \\ V_3 = 0.1\,V_1 + 0.6\,V_2 \\ V_2 = 1 \end{cases}$ $\begin{cases} V_1 = V_2 \\ V_2 = 0.9\,V_2 \\ V_3 = 0.1\,V_2 + 0.54\,V_2 \\ V_2 = 1 \end{cases}$ $\begin{cases} V_1 = 1 \\ V_2 = 0.9 \\ V_3 = 0.64 \\ V_2 = 1 \end{cases}$

2) $D_i = V_i \cdot S_i = \begin{cases} D_1 = 1 \cdot 0.005\,s = 0.005\,s \\ D_2 = 0.9 \cdot 0.03\,s = 0.027\,s \\ D_3 = 0.64 \cdot 0.008\,s = 0.00512\,s \end{cases}$

ESE 3.9

1) $\begin{cases} V_1 = 0.7\,V_2 \\ V_2 = V_1 \\ V_3 = 0.3\,V_2 + 0.3\,V_2 \\ V_2 = 1 \end{cases}$ $\begin{cases} V_1 = 0.7\,V_2 \\ V_2 = 0.7\,V_2 \\ V_3 = 0.3\,V_2 + 0.21\,V_2 \\ V_2 = 1 \end{cases}$ $\begin{cases} V_1 = 0.7 \\ V_2 = 0.7 \\ V_3 = 0.51 \\ V_2 = 1 \end{cases}$

2) $D_i = V_i \cdot S_i = \begin{cases} D_1 = 0.7 \cdot 0.005\,s = 0.0035\,s \\ D_2 = 0.7 \cdot 0.042\,s = 0.0294\,s \\ D_3 = 0.51 \cdot 0.01\,s = 0.0051\,s \end{cases}$

ESE 3.10

1) See E)

$\begin{cases} V_1 = \frac{\lambda_1}{\lambda} = 1 \\ V_2 = \frac{\lambda_2}{\lambda} = 0.7 \\ V_3 = \frac{\lambda_3}{\lambda} = 0.72 \end{cases}$

2) $U_i = \lambda_i S_i = \lambda D_i = \begin{cases} U_1 = 25\,i/s \cdot 0.01\,s = 0.25 \\ U_2 = 17.5\,i/s \cdot 0.04\,s = 0.7 \\ U_3 = 18\,i/s \cdot 0.03 = 0.54 \end{cases}$

ESE 3.11

Not done in this course

E)

$$\begin{cases} v_0 = 1 \\ v_1 = v_0 \\ v_2 = 0.7v_1 \\ v_3 = 0.3v_1 + 0.6v_2 \end{cases}$$