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5.

$$P = \begin{array}{c} \text{state} \\ 0 \\ 1 \\ 2 \\ 3 \end{array} \begin{array}{c} \begin{array}{cccc} 0 & 1 & 2 & 3 \end{array} \\ \begin{bmatrix} 0 & 1/8 & 1/16 & 1/16 \\ 0 & 3/4 & 1/8 & 1/8 \\ 0 & 0 & 1/2 & 1/2 \\ \underline{1} & 0 & 0 & 0 \end{bmatrix} \end{array}$$

(a)

$$(\pi_0, \pi_1, \pi_2, \pi_3) = (\pi_0, \pi_1, \pi_2, \pi_3) \begin{bmatrix} 0 & 1/8 & 1/16 & 1/16 \\ 0 & 3/4 & 1/8 & 1/8 \\ 0 & 0 & 1/2 & 1/2 \\ 1 & 0 & 0 & 0 \end{bmatrix}$$

$$\begin{pmatrix} \pi_0 = & & & & 1 \cdot \pi_3 \\ \pi_1 = & 1/8 \cdot \pi_0 + & 3/4 \cdot \pi_1 & & \\ \pi_2 = & 1/16 \cdot \pi_0 + & 1/8 \cdot \pi_1 + & 1/2 \pi_2 & \\ \pi_3 = & 1/16 \pi_0 + & 1/8 \pi_1 + & 1/2 \pi_2 & \\ 1 = & \pi_0 + & \pi_1 + & \pi_2 + & \pi_3 \end{pmatrix}$$

$$\Downarrow$$

$$\begin{pmatrix} -1 \cdot \pi_0 & & & + \pi_3 & = 0 \\ 1/8 \cdot \pi_0 - & 1/4 \cdot \pi_1 & & & = 0 \\ 1/16 \pi_0 + & 1/8 \cdot \pi_1 - & 1/2 \cdot \pi_2 & & = 0 \\ \pi_0 + & \pi_1 + & \pi_2 + & \pi_3 & = 1 \end{pmatrix}$$

$$A = \begin{bmatrix} -1 & 0 & 0 & 1 \\ 1/8 & -1/4 & 0 & 0 \\ 1/16 & 1/8 & -1/2 & 0 \\ 1 & 1 & 1 & 1 \end{bmatrix} \quad x = \begin{bmatrix} \pi_0 \\ \pi_1 \\ \pi_2 \\ \pi_3 \end{bmatrix} \quad b = \begin{bmatrix} 0 \\ 0 \\ 0 \\ 1 \end{bmatrix}$$

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$$A \cdot x = b \quad \Rightarrow \quad x = A^{-1} \cdot b = \begin{bmatrix} 0.15384615 \\ 0.53846154 \\ 0.15384615 \\ 0.15384615 \end{bmatrix}$$

$\therefore \pi_0 = 0.15384615$, $\pi_1 = 0.53846154$, $\pi_2 = 0.15384615$, $\pi_3 = 0.15384615$

(b) 기대평균 비용 $= 0 \cdot \pi_0 + 1000 \cdot \pi_1 + 3000 \cdot \pi_2 + 6000 \cdot \pi_3$

$= 0 \times 0.15384615 + 1000 \times 0.53846154$
$+ 3000 \times 0.15384615 + 6000 \times 0.15384615$

$= 1923.0769230769230769230769230769$ //

(c) $\mu_{00} = \frac{1}{\pi_0} = \frac{1}{0.15384615} = 6.5$ //