Topics Covered in Lecture 29

22-October-2002

- **Example 8.25**
  The steady state availability can be written as

$$\begin{aligned} A &= \pi_1 + \pi_2 + \pi_4 \\ &= \frac{\lambda + \beta + 2\left(\frac{\lambda}{\mu}\right)(\lambda_{OS} + \lambda + \beta) + 2\lambda_{OS}}{E} \end{aligned}$$

- **Example 8.26 [GARG 1999]**
  The steady state availability is given by

$$A = \pi_1 + \pi_6 + \pi_7 = \frac{1}{E}.\left[1 + \frac{\gamma_p}{\delta_p} + \frac{2\gamma_m + (1-c)\gamma_p}{\mu}\right]$$

- **Example 8.27:** considering diagnosis

$$\begin{aligned} H_{1,1}(t) &= 1 - e^{-(\lambda+\lambda_s)t} \\ H_{1C}(t) &= 1 - e^{-(\beta+\lambda_s)t} \\ H_{1,0}(t) &= 1 - e^{-(\lambda+\mu)t} \\ H_{1D}(t) &= \begin{cases} 1 - (1 - \frac{t}{T})e^{-\lambda t}, & t < T, \\ 1, & t \geq T, \end{cases} \\ H_{0,0}(t) &= 1 - e^{\mu t}. \end{aligned}$$

  The one-step transition probability matrix P of the DTMC embedded at the time of transitions is given by

$$P = \begin{array}{c} \\ 1,1 \\ 1C \\ 1,0 \\ 1D \\ 0,0 \end{array} \begin{array}{c} \begin{array}{ccccc} 1,1 & 1C & 1,0 & 1D & 0,0 \end{array} \\ \left[\begin{array}{ccccc} 0 & \frac{\lambda(1-c)}{\lambda+\lambda_s} & \frac{\lambda_c+\lambda_s c_s}{\lambda+\lambda_s} & \frac{\lambda_s(1-c_s)}{\lambda+\lambda_s} & 0 \\ 0 & 0 & \frac{\beta}{\beta+\lambda_s} & 0 & \frac{\lambda_s}{\beta+\lambda_s} \\ \frac{\mu}{\lambda+\mu} & 0 & 0 & 0 & \frac{\lambda}{\lambda+\mu} \\ 0 & 0 & \frac{1}{\lambda T}(1-e^{-\lambda T}) & 0 & 1-\frac{1}{\lambda T}(1-e^{-\lambda T}) \\ 0 & 0 & 1 & 0 & 0 \end{array}\right] \end{array}$$

We denote by the vector $\mathbf{v}$, the state probabilities of the embedded DTMC. To obtain steady-state probabilities, solve the equation

$$\mathbf{v} = \mathbf{v}P.$$