Solution 1.1 (a) Let \( \lambda_0 \) be the total arrival rate at queue. Let \( \lambda_1 \) be the arrival rate at node F.

By Burke's theorem, we have:

\[
\lambda_0 = \lambda + \lambda_1 \quad \text{and} \quad \lambda_1 = \rho \lambda_0
\]

\( \Rightarrow \)

\[
\lambda_0 = \frac{\lambda}{1-\rho} \quad \Rightarrow \quad \rho = \frac{\lambda_0}{\lambda}
\]

Now, using Jackson's theorem, we have:

\[
P(N = n') = (1 - \rho) \frac{\lambda}{\rho} \quad \text{for } n' = 0, 1, 2, \ldots
\]

\[
= (1 - \frac{\lambda}{\rho}) \frac{\lambda}{\rho} \quad \text{for } n' = 0, 1, 2, \ldots
\]

Solution 1.2 (c)

Solution 1.3 SPN are obtained by associating stochastic and timing information to Petri nets which is performed by attaching firing time to each transition.

Solution 1.4 (b)
Using Burke's theorem, we have

at queue 1, \[ \lambda_1 = \lambda + q \lambda_2, \]
at queue 2, \[ \lambda_2 = b \lambda_1. \]

On solving the above two equations obtained, we have

\[ \lambda_1 = \lambda + q \lambda_1 \]
\[ \Rightarrow \lambda_1 (1 - q b) = \lambda \]

\[ \Rightarrow \lambda_1 = \frac{\lambda}{1 - q b}, \quad \lambda_2 = \frac{b \lambda}{1 - q b} \]

\[ \therefore \lambda_1 = 12.5 \text{ /sec} \quad \lambda_2 = 6.25 \text{ /sec} \]

Sol 26.7 a)

Using Burke's theorem

At queue 1, \[ \lambda_1 = \lambda_2 + (1 - q) \lambda_2 \]
\[ \Rightarrow \lambda_2 = \frac{(1 - q)}{(1 - b)} \lambda_1 \]
\[ P[\text{Queue 1 is busy}] = P[\text{Queue 1 has at least 1 job}] = 1 - P[\text{No job at queue 1}] = 1 - P[C_0, C] \]

Similarly,
\[ P[\text{Queue 2 is busy}] = 1 - P[C, C] \]

Sol. [7.]

Sol. [8.]