MODEL - II (M/M/1) : (N/FCFS) Numerical - 02

Q: A barber shop has space to accommadate only 10 customer. He can serve only one person at a time. If a customer comes to his shop and finds it full, he goes to the next shop. Customer randomly arrive at an average rate $\lambda = 10$ per hour and the barber's service time is negative exponential with an average of $1/\mu = 5$ minutes per customer. Find P_0 and P_n.

Solution :

$$N = 10$$

$$\lambda = \frac{10}{60} = \frac{1}{6} \text{ per min.}$$

$$\mu = \frac{1}{5} \text{ per min.}$$

$$\rho = \frac{\lambda}{\mu} = \frac{\frac{1}{6}}{\frac{1}{5}} = \frac{5}{6} = 0.8334$$

(i) $P_0 = \frac{1-\rho}{1-\rho^{N+1}}$

$= \frac{1-0.8334}{1-(0.8334)^{11}} = \frac{0.1667}{0.8654}$

$= 0.1925$

(ii) $P_n = \frac{1-\rho}{1-\rho^{N+1}} \rho^n$

$= P_0 \rho^n$

$= (0.1925)(0.8334)^n \quad [n = 0, 1, 2, \ldots 10]$