Answer on Question #83934 – Math – Statistics and Probability

Workers come to tool store room to receive special tools (required by them) for accomplishing a particular project assigned to them. The average time between two arrivals is 60 seconds and the arrivals are assumed to be Poisson distribution. The average service time (of the tool room attendant) is 40 seconds. Determine:

Question

i. Average queue length

Solution

Mean arrival rate:

$$\lambda = \frac{60}{60}\ per\ second = 1\ per\ minute$$

Mean service rate:

$$\mu = \frac{60}{40}\ per\ second = 1.5\ per\ minute$$

Average number of workers in the waiting line:

$$L_q = \frac{\lambda}{\mu} \cdot \frac{\lambda}{\mu - \lambda} = \frac{1}{1.5} \cdot \frac{1}{1.5 - 1} = \frac{4}{3} = 1.33\ workers$$

Question

ii. Average length of non-empty queues

Solution

$$L_n = \frac{\mu}{\mu - \lambda} = \frac{1.5}{1.5 - 1} = 3\ workers$$

Question

iii. Average number of workers in system including the worker being attended

Solution

$$L_s = \frac{\lambda}{\mu - \lambda} = \frac{1}{1.5 - 1} = 2\ workers$$

Question

iv. Mean waiting time of an arrival

Solution

$$W_q = \frac{\lambda}{\mu} \cdot \frac{1}{\mu - \lambda} = \frac{1}{1.5} \cdot \frac{1}{1.5 - 1} = \frac{4}{3} = 1.33\ minutes$$

Question

v. Average waiting time of an arrival (worker) who waits

Solution

$$W_s = \frac{1}{\mu - \lambda} = \frac{1}{1.5 - 1} = 2\ minutes$$