(iii)

$\cancel{P = \left(\frac{\lambda}{\mu}\right)^4 \left(1-\frac{\lambda}{\mu}\right)}$

$\cancel{\frac{99}{100} = \left(\frac{1}{3}\right)^4 \left(1-\frac{1}{3}\right) = \left(\frac{1}{3}\right)^4 \frac{2}{3}}$

$\cancel{E[N_q] = \frac{\lambda^2}{\mu(\mu-\lambda)} = \frac{1^2}{3(3-1)} = \frac{1}{6} = 0.16.}$

$\cancel{E(W_q) = \frac{\lambda}{\mu \times \mu(-\lambda)} = \frac{1}{3(3-1)} = \frac{1}{6}}$

$\cancel{= 0.166}$

$1 - P(w) = 0.99$

$P(w) = 0.01$

$e^{-(\mu-\lambda)t} = 0.01$

$-(\mu-\lambda)t = \log 0.01$

$-2t = -4.6$

$t = 2.3$

he must arrive before 3 minutes

Prashant Kumar

17JE003058

Q.2 Arrival rate of customer, λ 1/minute

Average time to purchase ticket, $\frac{1}{\mu}$ 20 seconds

(i) $\lambda = 1$,

$\frac{1}{\mu} = 20 \Rightarrow \mu = \frac{1}{20}$ / sec.

$= \frac{1}{20} \times 60 = 3$ / min.

$E = \frac{1}{\mu - \lambda} = \frac{1}{3-1} = \frac{1}{2}$ min

$\therefore E[\text{Total time}] = \frac{1}{2} + \frac{3}{2} = 2$ min.

He arrives before 2 min so he can expect to be seated for tip-off.

(ii) ~~$\lambda = 1$ / minute~~

~~in 1 minute 3 tickets will be sold~~

~~so probability = $\frac{1}{3}$ = 33.3 %~~

$P_n = \left(\frac{\lambda}{\mu}\right)^n \left[1 - \frac{\lambda}{\mu}\right] = \left(\frac{1}{3}\right)^n \left(1 - \frac{1}{3}\right)$

$= \frac{1}{9} \times \frac{2}{3} = \frac{2}{27}$

$= 0.074$