Ans 1

(i) b.   (ii) a   (iii)   (iv) a   (v) d.

Ans ② $\lambda = 0.35$ parts/min, $\frac{1}{\mu} = 2$ min/parts.

$\mu = 30$ parts/hr $= 0.5$ parts/min.

$\lambda < \mu \rightarrow$ system works.

$\int = \frac{\lambda}{\mu} = \frac{0.35}{0.5} \times \frac{10^7}{100} = 0.7$

Probability of 8 parts in system, $P_8 = \int^8 \cdot P_0$.

$P_0 = 1 - \int = 0.3$, . $P_8 = (0.7)^8 \times 0.3 = 0.2255$.

Ans -3 $\lambda = 5$ car/hr. $\frac{1}{\mu} = 10$ min/car.

$\mu = 6$ car/hr.

$\lambda < \mu \rightarrow$ system works.

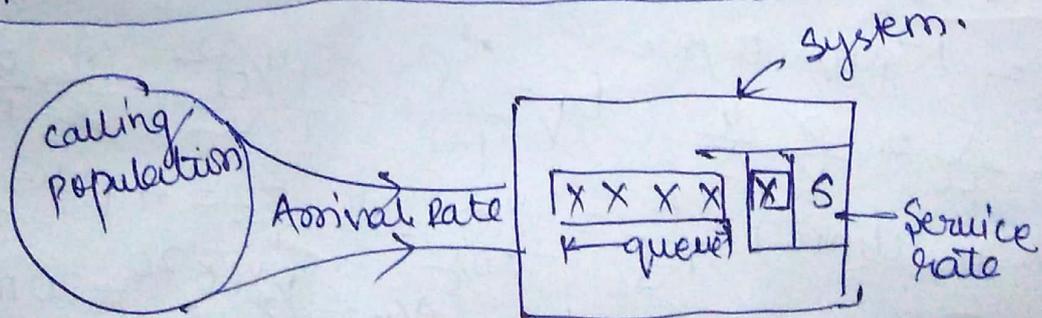$\int = \frac{\lambda}{\mu} = \frac{5}{6}$. $\quad Lq = \frac{\int^2}{1-\int} = \frac{(5/6)^2}{1-\frac{5}{6}}$

$Lq = \frac{25}{36} \times \frac{6}{1} = \frac{25}{6} = 4.167$ car.

$Lq = \lambda \cdot Wq$, $\quad Wq = \frac{Lq}{\lambda} = \frac{\frac{25}{6}}{5} = \frac{25}{6} \times \frac{1}{5} = \frac{5}{6}$ hrs

$Wq = \frac{5}{6}$ hr $= 50$ min.

Ans-4

$\rightarrow (a/b/c):(d/e/f)$.

Continued to Ans 4

a = probability distribution for the arrival pattern,

b = _____ " _____ " _____ " _____ : service pattern.

c = No. of server in the system.

d = Service Rule or service order.

e = Size or capacity of system.

f = Size or capacity of calling population

Ex:- $(M/M/1):(FIFO/\infty/\infty)$.

Customer Attitude :→

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                    |
         ┌──────────┴──────────┐
         ↓                     ↓
      Patient              Impatient
                               |
                  ┌──────┬─────┴─────┬──────────┐
                  ↓      ↓           ↓          ↓
               Jockey  Baulking   Reneging   Cheater.
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Jockey → changing queue in hope to get service faster.

Baulking → customer doesn't join the que and leave the system. as que is very long

Reneging → join the que for short duration & leave the system as system is moving very slowly.

Cheater → customer takes illegal means like fighting, bribes, etc in hope to get service faster.

Ans-5 $\lambda = 12$ patients/hr. $\frac{1}{\mu} = 4$ min/cust.

$\mu = 15$ patients/hr.

$\int = \frac{\lambda}{\mu} = \frac{12}{15} = \frac{4}{5}$.

$Lq = \frac{\int^2}{1-\int} = \frac{(4/5)^2}{1-4/5} = \frac{16}{25} \times \frac{5}{1} = 3.2$

Ls (in the clinic) $= \frac{\int}{1-\int} = \frac{4/5}{1-4/5} = \frac{4}{5} \times \frac{5}{1} = 4$ patient.

$Ls = \lambda Ws$, $Ws = \frac{Ls}{\lambda} = \frac{4}{12} = \frac{1}{3} \times 60 \, 20 = 20$ min (in clinic)

$Lq = \lambda Wq$, $Wq = \frac{Lq}{\lambda} = \frac{16}{5} \times \frac{1}{12} \times 60 \, 4 = 16$ min (in queue)