

26/3/23

HW7

① $\lambda = 1/12$ customers/min.

$\mu_{\text{copy}} : \text{Exp}(8) ; \mu_{\text{copy}} = \frac{1}{E(S_{\text{copy}})} = \frac{1}{8}$

$\mu_{\text{checkout}} : \text{Exp}(2) ; \mu_{\text{checkout}} = \frac{1}{E(S_{\text{checkout}})}$
 $= \frac{1}{2}$

② $M/M/1$

$\mu = \frac{1}{8+2}$

$$\rho = \frac{\lambda}{c \mu} = \frac{1/12}{1 \times 1/10}$$

$$= \frac{10}{12} = 0.833$$

③ $\mu = \frac{1}{10}$

$$L = \frac{p}{1-p} = \frac{0.833}{1-0.833} = 4.988$$

$$W = \frac{L}{\lambda} = \frac{4.988}{1/12}$$

$$= 59.85$$

$$W_Q = W - \frac{1}{\mu}$$

$$= 59.85 - \frac{1}{1/10}$$

$$= 59.85 - 10$$

$$= 49.85$$

$$\begin{aligned} L_Q &= \lambda W_Q \\ &= \frac{1}{12} \times 49.85 \\ &= 4.1547 \end{aligned}$$

The long term average number of customers waiting in line is 4.1547.

③ $W = 59.85$

The long term average time a customer spends in the copy center is 59.85 minutes