(a) arrival $\lambda = 10$

System A $\mu = 6$ $M/M/3$

System B $\mu = 18$ $M/M/1$

(b)

System A

(i) $L = \frac{\rho(m\rho)^m \pi_0}{m!(1-\rho)^2} + \frac{\lambda}{\mu}$ $\rho = \frac{\lambda}{m\mu} = \frac{10^5}{3 \times 6_3} = \frac{5}{9}$ $m = 3$

$m\rho = \frac{5}{9} \times 3 = \frac{5}{3}$

$L = \frac{\frac{5}{9}(\frac{5}{3})^3 \pi_0}{3!(1-\frac{5}{9})^2} + \frac{10}{6}$ $\pi_0 = \left[\frac{(m\rho)^m}{m!(1-\rho)} + \sum_{k=0}^{2} \frac{(m\rho)^k}{k!}\right]^{-1}$

$= \frac{24}{139}$

$= \frac{1135}{556} = 2.0414$

(ii)

$Q = L - \frac{10}{6} = \frac{625}{1668} = 0.3747$

(iii)

$W = \frac{L}{\lambda} = \frac{\frac{1135}{556}}{10} = 0.20414$

(iv)

$D = \frac{Q}{\lambda} = 0.03747$

System B

(i) $L = \frac{\rho}{1-\rho} = \frac{\lambda}{\mu-\lambda} = \frac{10}{18-10} = \frac{5}{4} = 1.25$

(ii) $Q = \frac{\lambda^2}{\mu(\mu-\lambda)} = \frac{100}{18 \times 8} = \frac{25}{36} = 0.694$

(iii) $W = \frac{L}{\lambda} = \frac{\frac{5}{4}}{10} = \frac{1}{8} = 0.125$

(iv) $D = \frac{Q}{\lambda} = \frac{\frac{25}{36}}{10} = \frac{5}{72} = 0.0694$

(c)

because

$L_B < L_A \qquad W_B < W_A$

choose System B