

ans:

$$\bullet P_f = 100 - Q_f, P_d = 40 - 0.5Q_d, TC = 10 + 20Q$$

$$\Rightarrow MC = 20, TR_f = P_f \times Q_f = 100Q_f - Q_f^2 \Rightarrow MR_f = -2Q_f + 100$$

$$\Rightarrow MC = 20 = -2Q_f + 100 \Rightarrow \boxed{Q_f = 40 \Rightarrow P_f = 60}$$

$$\bullet TR_d = P_d \times Q_d = 40Q_d - 0.5Q_d^2 \Rightarrow MR_d = -Q_d + 40$$

$$\Rightarrow -Q_d + 40 = 20 \Rightarrow \boxed{Q_d = 20 \Rightarrow P_d = 30}$$

$$\Rightarrow TL = TR_f(Q_f) + TR_d(Q_d) - TC(Q_f + Q_d) = 107400$$

$$\Rightarrow P_f \left(1 - \frac{1}{e_f}\right) = 10 = P_d \left(1 - \frac{1}{e_d}\right) \Rightarrow \begin{cases} e_f = -3 \\ e_d = -1.5 \end{cases}$$

