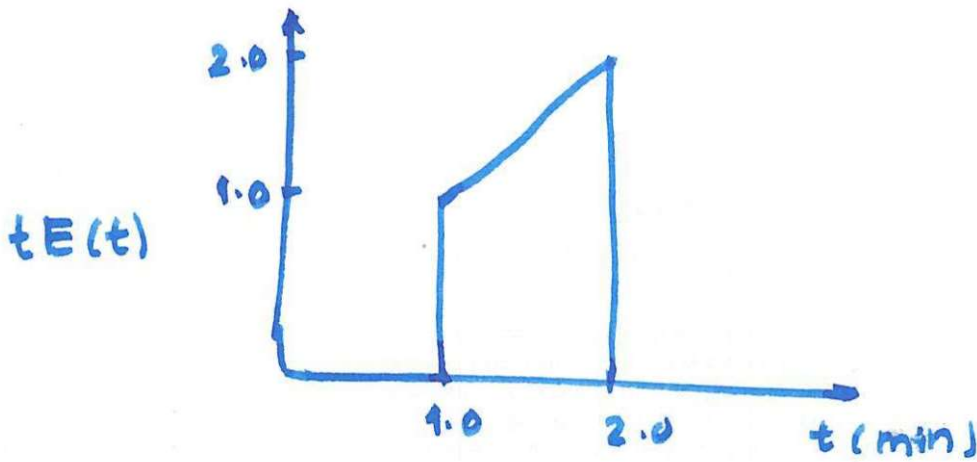
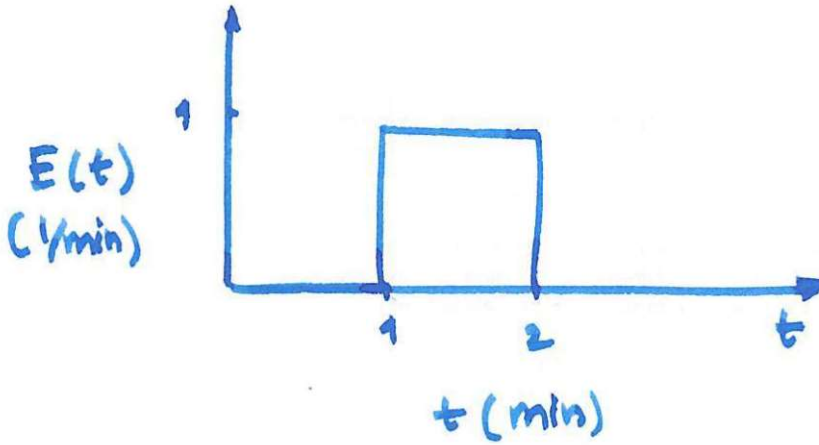


P16-6

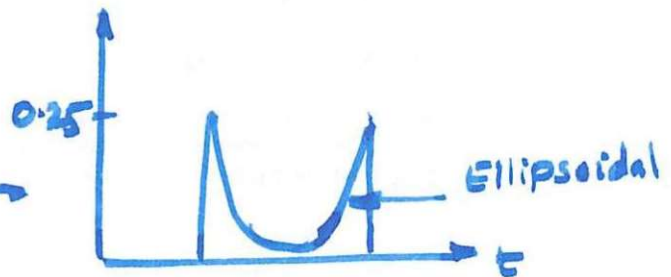
①

a)



$$t_m = \int_0^{\infty} t E(t) dt = 1 + \frac{1}{2} \cdot 1 \times 1 = 1.5 \text{ min}$$

$$\sigma^2 = \int_0^{\infty} (t - t_m)^2 E(t) dt$$



$$\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2}$$

$$= 1 \times 0.25 - \frac{1}{2} \times \pi \times 0.25 \times 0.5$$

$$\sigma = \sqrt{0.053} = 0.23$$

b) Fraction of fluid that spends a time 1.5 min or longer

$$\begin{aligned} &= \int_{1.5}^{\infty} E(t) dt \\ &= 0.5 \end{aligned}$$

c) Fraction of fluid that spends 2 min or less in the reactor

$$\begin{aligned} &= \int_0^2 E(t) dt \\ &= 1.0 \end{aligned}$$

d) Fraction of fluid that spends between 1.5 min and 2 min

$$\begin{aligned} &= \int_{1.5}^2 E(t) dt \\ &= 0.5. \end{aligned}$$