

- 6.15** The waveform for the current in a $50\text{-}\mu\text{F}$ capacitor is shown in Fig. P6.15. Determine the waveform for the capacitor voltage.

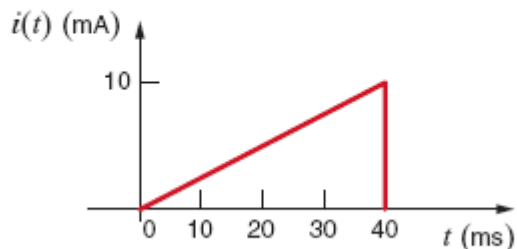


Figure P6.15

SOLUTION:

$$t < 0, \quad i(t) = 0, \quad v(t) = 0$$

$$0 \leq t < 40\text{ms}, \quad i(t) = 0.25t$$

$$v(t) = \frac{1}{C} \int i(t) dt + v_0$$

$$v(t) = \frac{1}{50\mu} \int 0.25t dt$$

$$v(t) = \frac{0.25}{50\mu} \left(\frac{t^2}{2} \right)$$

$$v(t) = 2500t^2 \text{V}$$

$$t \geq 40\text{ms}, \quad i(t) = 0$$

$$v(t) = \frac{1}{50\mu} \int 0 dt + 2500(40\text{ms})^2$$

$$v(t) = 4\text{V}$$

$$v(t) = \begin{cases} 0 & t < 0 \\ 2500t^2 \text{ V} & 0 \leq t < 40 \text{ ms} \\ 4 \text{ V} & t \geq 40 \text{ ms} \end{cases}$$

$$t < 0$$

$$0 \leq t < 40 \text{ ms}$$

$$t \geq 40 \text{ ms}$$