Chapter 6, Solution 5.

The voltage across a 10-μF capacitor is shown in Fig. 6.45. Find the current waveform.

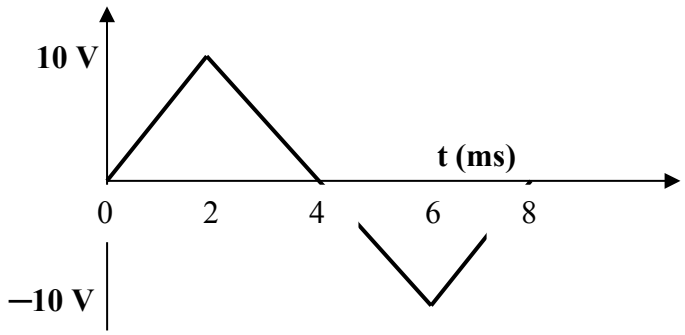

Figure 6.45
For Prob. 6.5.

Solution

Step 1. $v = \begin{cases} 5000t, & 0 < t < 2ms \\ 20 - 5000t, & 2 < t < 6ms \\ -40 + 5000t, & 6 < t < 8ms \end{cases}$ and $i_C(t) = Cdv_C(t)/dt$.

Step 2. For $0<t<2ms$, $i_C(t) = 10x10^{-6}d(5000t)/dt = 50$ mA;
for $2ms<t<6ms$, $i_C(t) = 10x10^{-6}d(20-5000t)/dt = -50$ mA;
and for $6ms<t<8ms$, $i_C(t) = 10x10^{-6}d(-40+5000t)/dt = 50$ mA.

$$\text{or } i_C(t) = \begin{cases} 50\,mA, & 0<t<2\,ms \\ -50\,mA, & 2<t<6\,ms \\ 50\,mA, & 6<t<8\,ms \end{cases}$$