Chapter 6, Solution 30.

$$v_o = \frac{1}{C}\int_o^t i\,dt + i(0)$$

For $0 < t < 1$, $i = 90t$ mA,

$$v_o = \frac{10^{-3}}{3x10^{-6}}\int_o^t 90t\,dt + 0 = 15t^2\,kV$$

$v_o(1) = 15$ kV

For $1 < t < 2$, $i = (180 - 90t)$ mA,

$$v_o = \frac{10^{-3}}{3x10^{-6}}\int_1^t (180 - 90t)\,dt + v_o(1)$$

$= [60t - 15t^2]\Big|_1^t + 15kV$

$= [60t - 15t^2 - (60–15) + 15]$ kV $= [60t - 15t^2 - 30]$ kV

$$v_o(t) = \begin{cases} 15t^2\,kV, & 0 < t < 1 \\ [60t - 15t^2 - 30]\,kV, & 1 < t < 2 \end{cases}$$