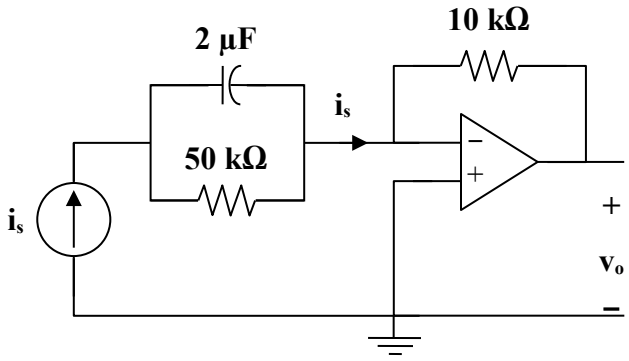
Chapter 7, Solution 74.

Let v = capacitor voltage. For $t < 0$, $v(0) = 0$
For $t > 0$, $i_s = 10\ \mu A$.



Since the current through the feedback resistor is i_s, then

$$v_o = -i_s x 10^4 \text{ volts} = -10^{-5} x 10^4 = \mathbf{-100\ mV}.$$

It is interesting to look at the capacitor voltage.

$$i_s = C\frac{dv}{dt} + \frac{v}{R}$$
$$v(t) = v(\infty) + \left[\, v(0) - v(\infty) \right] e^{-t/\tau}$$

It is evident that

$$\tau = RC = (2 \times 10^{-6})(50 \times 10^3) = 0.1$$

At steady state, the capacitor acts like an open circuit so that i_s passes through R. Hence,

$$v(\infty) = i_s R = (10 \times 10^{-6})(50 \times 10^3) = 0.5\ V$$

Then the voltage across the capacitor is,

$$v(t) = \mathbf{500(1 - e^{-10t})\ mV}.$$