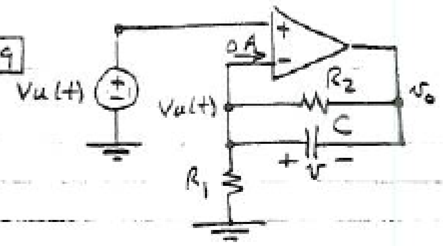
3.49



By KCL at the inverting input of the op amp,

$$-\frac{Vu(t)}{R_1} + C\frac{dv}{dt} + \frac{v}{R_2} = 0$$

$$\frac{dv}{dt} + \frac{v}{R_2C} = -\frac{V}{R_1C}u(t)$$

For $t < 0$ s, $v(t) = 0$ V $\Rightarrow v(0) = 0$ V.

For $t \geq 0$ s, $\frac{dv}{dt} + \frac{v}{R_2C} = -\frac{V}{R_1C} \Rightarrow v(t) = \frac{-V/R_1C}{1/R_2C} + Ae^{-t/R_2C}$

$$v(t) = -\frac{VR_2}{R_1} + Ae^{-t/R_2C}$$

$$v(0) = -\frac{VR_2}{R_1} + Ae^{-0} = 0 \Rightarrow A = \frac{VR_2}{R_1}$$

$$\therefore v(t) = -\frac{VR_2}{R_1} + \frac{VR_2}{R_1}e^{-t/R_2C}$$

Hence, $v(t) = \left(-\frac{VR_2}{R_1} + \frac{VR_2}{R_1}e^{-t/R_2C}\right)u(t) = -\frac{VR_2}{R_1}(1 - e^{-t/R_2C})u(t)$

By KVL,

$$v_0(t) = -v(t) + Vu(t) = \left(\frac{VR_2}{R_1} - \frac{VR_2}{R_1}e^{-t/R_2C}\right)u(t) + Vu(t)$$

$$v_0(t) = \frac{VR_2}{R_1}u(t) - \frac{VR_2}{R_1}e^{-t/R_2C}u(t) + \frac{VR_1}{R_1}u(t)$$

$$v_0(t) = \left(\frac{(R_1+R_2)V}{R_1} - \frac{VR_2}{R_1}e^{-t/R_2C}\right)u(t)$$