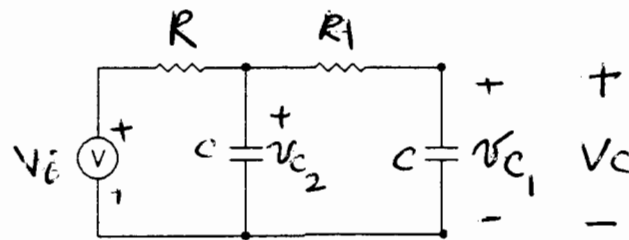


EE 380-1 Quiz-3, Form-A

Name:

Number:



$$v_o = v_{c1}$$

write the state space equations of the circuit.

$$-v_i + R \left(C \frac{dv_{c1}}{dt} + C \frac{dv_{c2}}{dt} \right) + v_{c2} = 0 \quad \text{--- loop-1}$$

$$-v_{c2} + R_1 C \frac{dv_{c1}}{dt} + v_{c1} = 0 \quad \text{--- loop-2}$$

$$\therefore \frac{dv_{c1}}{dt} = \frac{-1}{R_1 C} v_{c1} + \frac{1}{R_1 C} v_{c2} \quad \text{--- (1)}$$

$$\frac{dv_{c2}}{dt} = \frac{1}{R_1 C} v_{c1} - \frac{1}{C} \left(\frac{1}{R_1} + \frac{1}{R} \right) v_{c2} + \frac{1}{RC} v_i \quad \text{--- (2)}$$

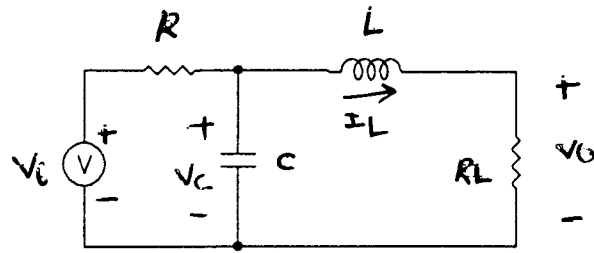
$$\begin{bmatrix} \dot{v}_{c1} \\ \dot{v}_{c2} \end{bmatrix} = \begin{bmatrix} \frac{-1}{R_1 C} & \frac{1}{R_1 C} \\ \frac{1}{R_1 C} & -\frac{1}{C} \left(\frac{1}{R_1} + \frac{1}{R} \right) \end{bmatrix} \begin{bmatrix} v_{c1} \\ v_{c2} \end{bmatrix} + \begin{bmatrix} 0 \\ \frac{1}{RC} \end{bmatrix} v_i$$

$$[v_o] = \begin{bmatrix} 1 & 0 \end{bmatrix} \begin{bmatrix} v_{c1} \\ v_{c2} \end{bmatrix} + \begin{bmatrix} 0 \end{bmatrix} v_i$$

EE 380-1 Quiz-3, Form-B

Name:

Number:



write the state space equations of the circuit.

$$-v_i + R \cdot (I_L + C \frac{dv_c}{dt}) + v_c = 0 \quad \text{Loop-1}$$

$$-v_c + L \frac{dI_L}{dt} + R_L \cdot I_L = 0 \quad \text{Loop-2}$$

$$v_o = R_L \cdot I_L$$

$$\therefore \frac{dv_c}{dt} = -\frac{1}{C} I_L - \frac{1}{R \cdot C} v_c + \frac{1}{R \cdot C} v_i \quad \text{--- (1)}$$

$$\frac{dI_L}{dt} = -\frac{R_L}{L} I_L + \frac{1}{L} v_c \quad \text{--- (2)}$$

$$\begin{bmatrix} \dot{I}_L \\ \dot{v}_c \end{bmatrix} = \begin{bmatrix} -\frac{R_L}{L} & \frac{1}{L} \\ -\frac{1}{C} & -\frac{1}{RC} \end{bmatrix} \begin{bmatrix} I_L \\ v_c \end{bmatrix} + \begin{bmatrix} 0 \\ \frac{1}{RC} \end{bmatrix} v_i$$

$$\begin{bmatrix} v_o \end{bmatrix} = \begin{bmatrix} R_L & 0 \end{bmatrix} \begin{bmatrix} I_L \\ v_c \end{bmatrix} + \begin{bmatrix} 0 \end{bmatrix} v_i$$