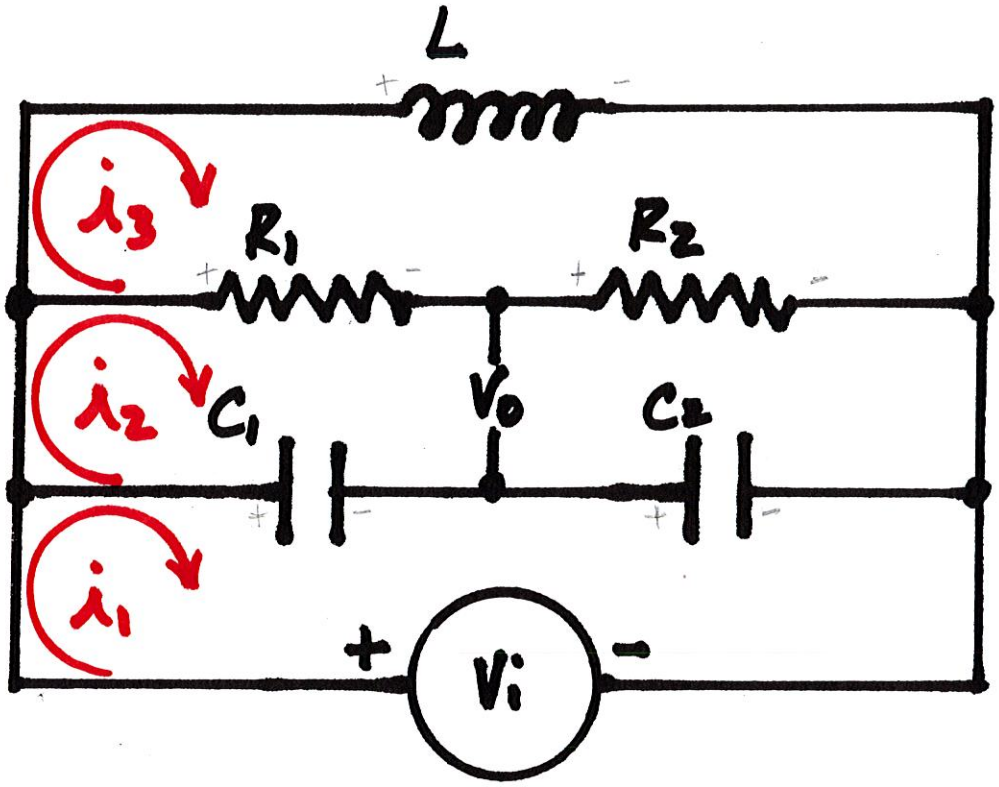

A) FIND the TRANSFER function: $G(s) = \frac{V_o(s)}{V_i(s)}$

STEP 1: Consume a Configuration

$i_1 > i_2 > i_3$

STEP 2: KIRCHOFF'S VOLTAGE LAW

Loop 1: $V_{C_1} + V_{C_2} - V_i = 0$

$$V_{C_1} + V_{C_2} = V_i$$

$$|V_{C_1}| = \frac{\int (i_1 - i_2)\,dt}{C_1}$$

$$|V_{C_2}| = \frac{\int (i_1 - i_2)\,dt}{C_2}$$

$$\frac{\int (i_1 - i_2)\,dt}{C_1} + \frac{\int (i_1 - i_2)\,dt}{C_2} = V_i$$

$$\boxed{\left(\frac{1}{C_1 + C_2}\right)\int (i_1 - i_2)\,dt = V_i} \quad -(1)$$

Loop 2:

$$V_{R_1} + V_{R_2} - V_{C_2} - V_{C_1} = 0$$

$$|V_{R_1}| = (i_2 - i_3) R_1$$

$$|V_{R_2}| = (i_2 - i_3) R_2$$

$$|V_{C_2}| = \frac{\int (i_1 - i_2)\, dt}{C_2}$$

$$|V_{C_1}| = \frac{\int (i_1 - i_2)\, dt}{C_1}$$

$$(i_2 - i_3) R_1 + (i_2 - i_3) R_2 - \frac{\int (i_1 - i_2)\, dt}{C_2} - \frac{\int (i_1 - i_2)\, dt}{C_1} = 0$$

$$\boxed{(R_1 + R_2)(i_2 - i_3) - \left(\frac{1}{C_1 + C_2}\right) \int (i_1 - i_2)\, dt = 0}$$

$-(2)$

Loop 3:

$$V_L - V_{R_2} - V_{R_1} = 0$$

$$|V_L| = \frac{L\, di_3}{dt}$$

$$|V_{R_2}| = (i_2 - i_3) R_2$$

$$|V_{R_1}| = (i_2 - i_3) R_1$$

$$\frac{L\, di_3}{dt} - (i_2 - i_3) R_2 - (i_2 - i_3) R_1 = 0$$

$$\boxed{\frac{L\, di_3}{dt} - (R_1 + R_2)(i_2 - i_3) = 0} \quad -(3)$$

$$|V_o| = |V_{oR_T}| - |V_{oC_T}|$$

$$|V_{oR_T}| = V_i \left(\frac{R_2}{R_1 + R_2} \right)$$

$$|V_{oC_T}| = V_i \left(\frac{C_1}{C_1 + C_2} \right)$$

$$|V_o| = V_i \left(\frac{R_2}{R_1 + R_2} \right) - V_i \left(\frac{C_1}{C_1 + C_2} \right)$$

$$|V_o| = V_i \left[\left(\frac{R_2}{R_1 + R_2} \right) - \left(\frac{C_1}{C_1 + C_2} \right) \right] \quad -(4)$$

$$|V_i| = V_o \left[\left(\frac{R_1 + R_2}{R_2} \right) - \left(\frac{C_1 + C_2}{C_1} \right) \right]$$

STEP3: Laplace Transform

$$\left(\frac{1}{C_1+C_2}\right)\int(i_1-i_2)\,dt = V_i \quad -(1)$$

$$\left(\frac{1}{C_1+C_2}\right)\left(\frac{1}{s}\right)(I_1 s - I_2 s) = V_i s \quad -(5)$$

$$(R_1+R_2)(i_2-i_3) - \left(\frac{1}{C_1+C_2}\right)\int(i_1-i_2)\,dt = 0 \quad -(2)$$

$$(R_1+R_2)(I_2 s - I_3 s) - \left(\frac{1}{C_1+C_2}\right)\left(\frac{1}{s}\right)(I_1 s - I_2 s) = 0 \quad -(6)$$

$$\frac{L i_3 d}{dt} - (R_1+R_2)(i_2-i_3) = 0 \quad -(3)$$

$$L s I_3 s - (R_1+R_2)(I_2 s - I_3 s) = 0 \quad -(7)$$

$$V_0 = V_i\left[\left(\frac{R_2}{R_1+R_2}\right) - \left(\frac{C_1}{C_1+C_2}\right)\right] \quad -(4)$$

$$V_0 s = V_i s\left[\left(\frac{R_2}{R_1+R_2}\right) - \left(\frac{C_1}{C_1+C_2}\right)\right] \quad -(8)$$