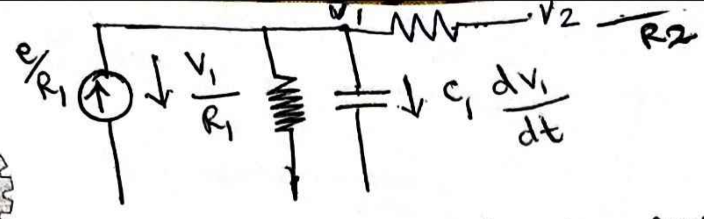


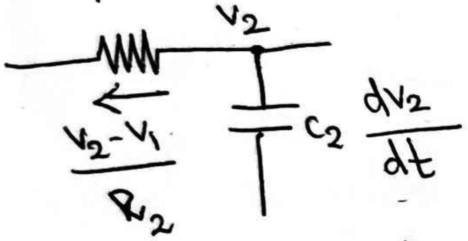
★ At node 1 by kirchoff's current law

$$\frac{V_1}{R_1} + C_1 \frac{dV_1}{dt} + \frac{V_1 - V_2}{R_2} = \frac{e}{R_1}$$

★ on taking laplace transform of above eqn with zero initial conditions

$$\frac{V_1(S)}{R_1} + C_1 S\, V_1(S) + \frac{V_1(S)}{R_2} - \frac{V_2(S)}{R_2} = \frac{E(S)}{R_1}$$

$$V_1(S)\left[\frac{1}{R_1} + SC_1 + \frac{1}{R_2}\right] - \frac{V_2(S)}{R_2} = \frac{E(S)}{R_1} \rightarrow (1)$$



★ At node 2 by kirchoff's current law

$$\frac{V_2 - V_1}{R_2} + C_2 \frac{dV_2}{dt} = 0$$

★ Apply Laplace transform with zero initial conditions.

$$\frac{V_2(S)}{R_2} - \frac{V_1(S)}{R_2} + C_2 S\, V_2(S) = 0$$

$$\frac{V_1(S)}{R_2} = \frac{V_2(S)}{R_2} + C_2 S\, V_2(S) = \left[\frac{1}{R_2} + SC_2\right] V_2(S)$$

$$\therefore V_1(S) = \left[1 + SC_2R_2\right] V_2(S) \rightarrow (2)$$

Sub for $V_1(S)$ from eqn (2) in eqn (1) we get

$$(1 + SR_2C_2)\, V_2(S)\left[\frac{1}{R_1} + SC_1 + \frac{1}{R_2}\right] - \frac{V_2(S)}{R_2} = \frac{E(S)}{R_1}$$

$$\left[\frac{(1 + SR_2C_2)(R_2 + R_1 + SC_1R_1R_2) - R_1}{R_1R_2}\right] V_2(S) = \frac{E(S)}{R_1}$$

Transfer function :-

$$\frac{V_2(S)}{E(S)} = \frac{R_2}{\left[(1 + SR_2C_2)(R_1 + R_2 + SC_1R_1R_2) - R_1\right]}$$