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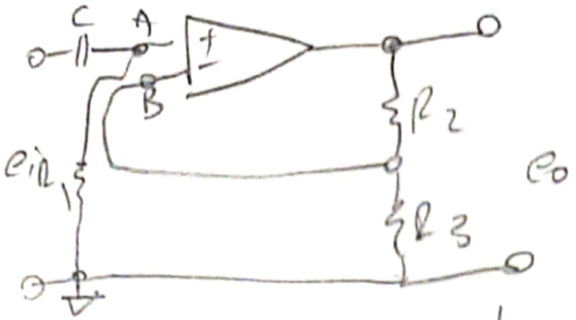
$\boxed{1}$



Assuming ideal op-amp

∴ infinite input impedance

Assuming voltage at point A is eA

$\therefore V = IR \quad \therefore \quad E_A(s) = R_1 \quad , E_i(s) = \frac{1}{cs+R_1}$

$$\therefore \frac{E_A(s)}{E_i(s)} = \frac{R_1}{\frac{1}{cs}+R_1} \times cs = \frac{R_1 cs}{1+R_1 cs}$$

Assume voltage at B is e_B

$\therefore E_B(s) =$ potential divider $= \frac{R_3}{R_2+R_3} E_o(s) \quad \because [E_A(s) - E_B(s)]K = E_o(s)$

assuming $K \gg 1$ (for ideal op amp)

$\therefore \quad E_A(s) = E_B(s)$

$$\therefore E_A(s) = \frac{R_1 Cs}{1+R_1 Cs} E_i(s) = E_B(s) = \frac{R_3}{R_2+R_3} E_o(s)$$

$$\therefore \frac{E_o(s)}{E_i(s)} = \frac{R_2+R_3}{R_3} \frac{R_1 Cs}{1+R_1 Cs}$$

$\boxed{2}$ Equation of Motion:-

$$m\ddot{x}_o + b(\dot{x}_o - \dot{x}_i) + k(x_o - x_i) = 0$$

$$\therefore \mathcal{L}\{m\ddot{x}_o + b\dot{x}_o + kx_o = b\dot{x}_i + kx_i\}$$

Taking Laplace transform, assuming zero initial conditions

$$\therefore L(s) = (ms^2 + bs + k)X_o(s) = (bs + k)X_i(s)$$

$$\therefore X_o(s)/X_i(s) = \frac{bs+k}{ms^2+bs+k}$$

Free body:-

spring force sum

suspension (damping) force sum