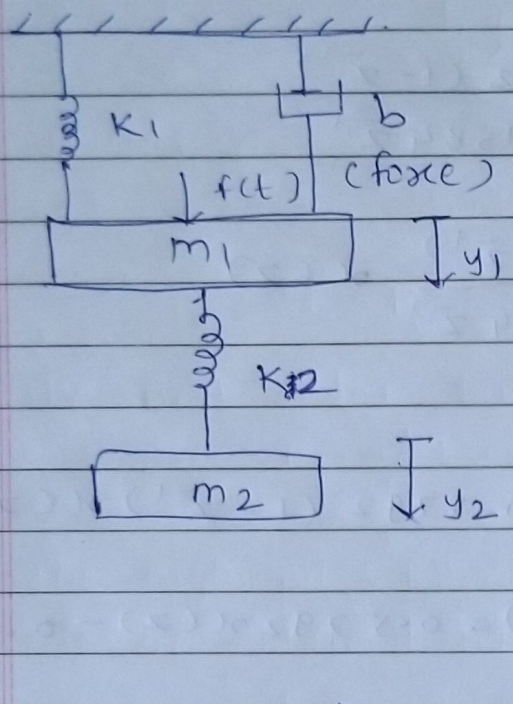
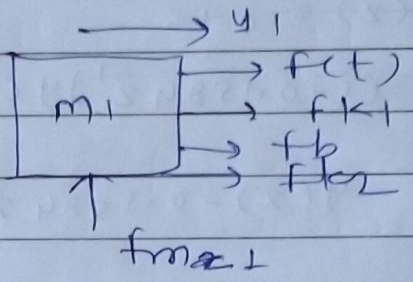
1) Transfer function of system:-



General Equation -

$$\frac{m d^2x}{dt^2} + \frac{b\,dx}{dt} + K\,x(t) = f(t)$$

free body diagram -



$$fm_1 = m_1 \frac{d^2y_1}{dt^2} \qquad fb = \frac{B\,dy_1}{dt}$$

$$fk_1 = k_1 y_1$$

$$fk_2 = k_2 (y_1 - y_2)$$

$$f(t) = m_1 \frac{d^2y_1}{dt^2} + B \frac{dy_1}{dt} + k_1 y_1 + k_2 (y_1 - y_2)$$

$$f(t) = 2 \sin(10t)$$

$$m_1 = 100, \; k_1 = 50, \; b = 50$$

$$(\text{or } (\sin(t)) = 100 \frac{d^2y_2}{dt^2} + 50 \frac{dy_1}{dt} + 50 y_1 + k_2 (y_1 - y_2)$$

$$0 = m_2 \frac{d^2y}{dt^2} + k_2 (y_2 - y_1)$$

$$0 = m_2 \frac{d^2y}{dt^2} + k_2 y_2 - k_2 y_1$$

$$k_2 y_1 - k_2 y_2 = m_2 \frac{d^2y}{dt^2}$$

$$m_1 y_1'' = k_2 (y_2 - y_1) - k_1 y_1 - b y_1'$$

$$m_2 y_2'' = -k_2 (y_2 - y_1)$$

$$m_2 y_2'' = k_2 (y_1 - y_2)$$

$$y_1'' = \frac{1}{m_1} \left[k_{12} (y_2 - y_1) - k_1 y_1 - c y_1' \right]$$

$$y_2'' = \frac{1}{m_2} \left[k_{12} (y_1 - y_2) \right]$$

$$y_2'' = \frac{1}{m_2} \left[2 \sin(10t) - k_{12} (y_1 - y_2) \right]$$