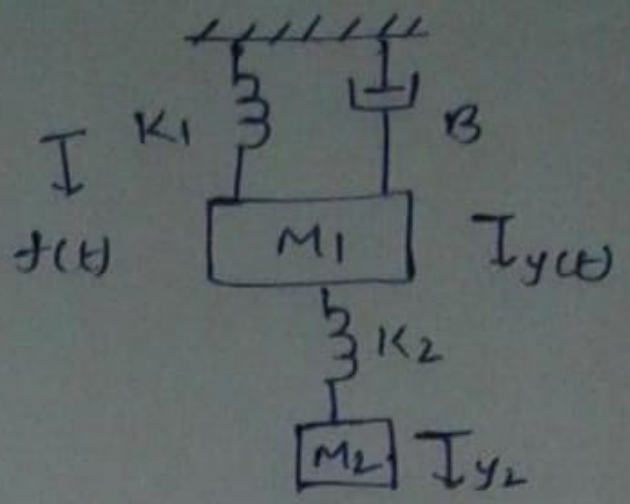
Problem-1



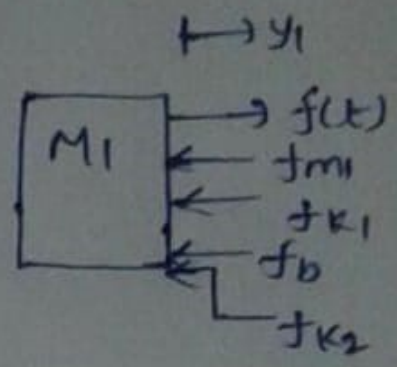
Free body diagram of M_1.

$$f_{m_1} = M_1 \frac{d^2y_1}{dt^2}$$

$$f_b = B \frac{dy_1}{dt}$$

$$f_{K_1} = K_1 y_1$$

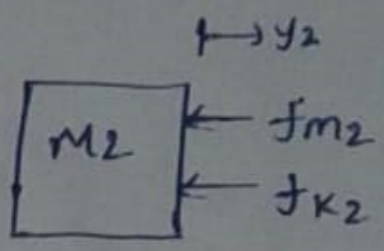
$$f_{K_2} = K_2 (y_1 - y_2)$$



$$f_{m_1} + f_b + f_{K_1} + f_{K_2} = f(t)$$

$$M_1 \frac{d^2y_1}{dt^2} + B \frac{dy_1}{dt} + K_1 y_1 + K_2 (y_1 - y_2) = f(t) \longrightarrow (1)$$

Free body diagram of M_2 :



$$f_{m_2} = M_2 \frac{d^2y_2}{dt^2}$$

$$f_{K_2} = K_2 (y_2 - y_1)$$

$$f_{m_2} + f_{K_2} = 0$$

$$M_2 \frac{d^2y_2}{dt^2} + K_2 (y_2 - y_1) = 0 \longrightarrow (2)$$