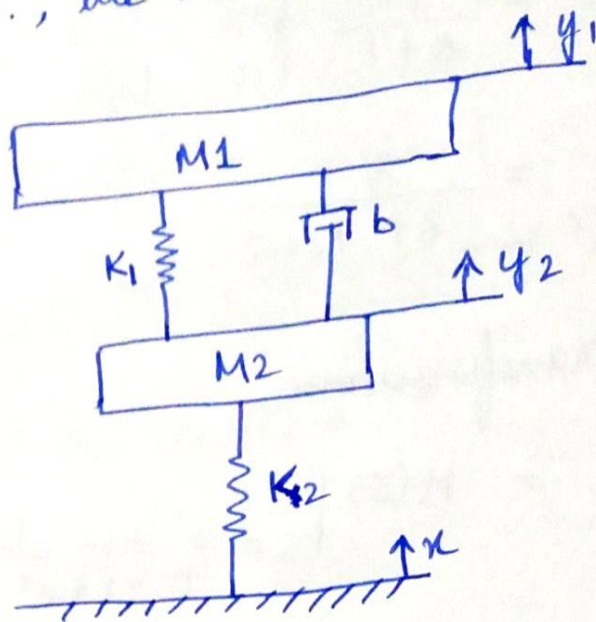
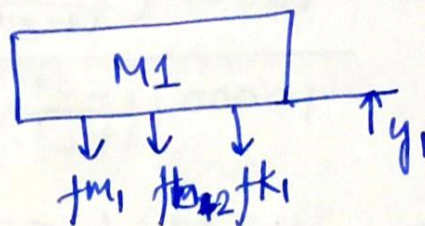


From figure 2., we have



FBD of mass M1,



where,

$$f_{m1} = M_1 \frac{d^2 y_1}{dt^2}$$

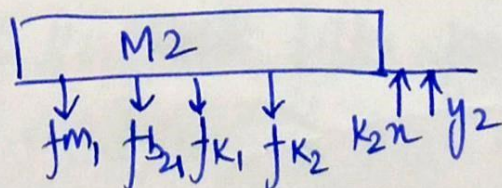
$$f_{b2} = b \left(\frac{dy_1}{dt} - \frac{dy_2}{dt} \right)$$

$$f_{K1} = K_1 (y_1 - y_2)$$

$$\therefore f_{m1} + f_b + f_{K1} = 0$$

$$\therefore M_1 \frac{d^2 y_1}{dt^2} + b \left(\frac{dy_1}{dt} - \frac{dy_2}{dt} \right) + K_1 (y_1 - y_2) = 0 \quad \text{--- (1)}$$

FBD of mass M2,



where,

$$f_{m2} = M_2 \frac{d^2 y_2}{dt^2}, \quad f_{b21} = b \left(\frac{dy_2}{dt} - \frac{dy_1}{dt} \right)$$

$$f_{K1} = K_1 (y_2 - y_1), \quad f_{K2} = K_2 y_2$$

$$\therefore f_{m2} + f_{b21} + f_{K1} + f_{K2} = K_2 x$$

$$\therefore M_2 \frac{d^2 y_2}{dt^2} + b \left(\frac{dy_2}{dt} - \frac{dy_1}{dt} \right) + K_1 (y_2 - y_1) + K_2 y_2 = K_2 x$$

! --- (2)