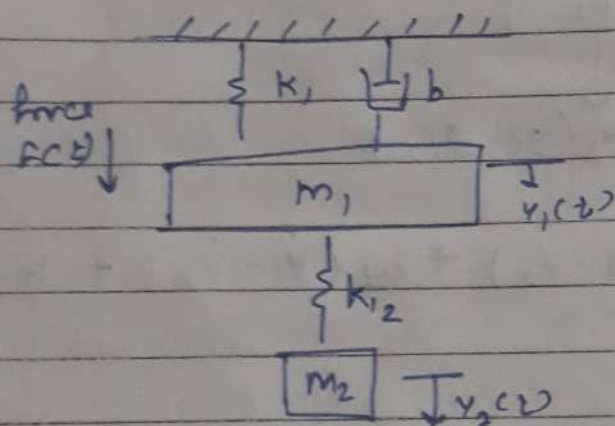


Q. 1) A dynamic vibration absorber is shown in fig. This system is representative of many situations involving the vibration of machine containing unbalanced components. The parameters M_2 & K_{12} may be chosen so that the main mass M_1 does not vibrate in the steady state when $F(t) = 2 \sin(10t)$.

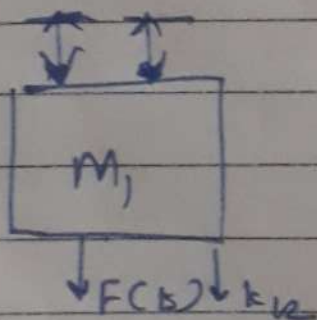
Obtain the differential equations describing this system.

Simulate this system for 10 sec. $M_1 = 100$, $K_1 = 50$, $b = 50$. Find the optimal value for M_2 & K_{12} so that M_1 does not vibrate.

Ans:



1) FBD for m_1

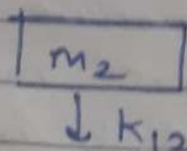


$$\therefore m_1 \frac{d^2 y_1}{dt^2} = F - K_1 y_1 - b \frac{dy_1}{dt} - K_{12} (y_1 - y_2)$$

$\therefore m_1 \frac{d^2 y_1}{dt^2}$

$$\therefore \frac{d^2 y_1}{dt^2} = \frac{1}{m_1} \left[F - K_1 y_1 - b \frac{dy_1}{dt} - K_{12} (y_1 - y_2) \right]$$

7) FBD for m_2



$$\therefore m_2 \frac{d^2 y_2}{dt^2} - K_{12} (y_1 - y_2) = 0$$

$$\therefore \frac{d^2 y_2}{dt^2} = \frac{1}{m_2} \left[K_{12} (y_1 - y_2) \right]$$