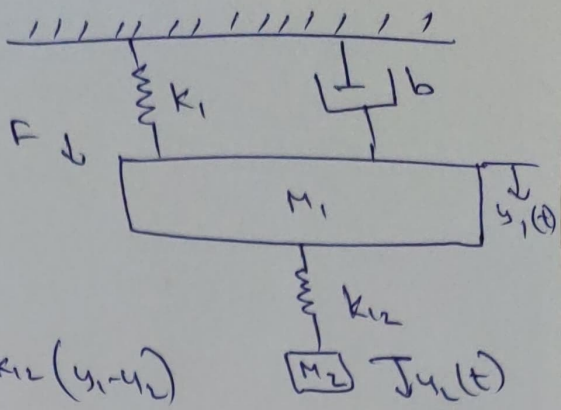
1.



The eqn of motion on M_1,

$$M_1 \frac{d^2y_1}{dt} = F - k_1 y_1 - b\frac{dy_1}{dt} - k_{12}(y_1 - y_2)$$

$$\Rightarrow \frac{d^2y_1}{dt} = \left\{F - k_1 y_1 - b\frac{dy_1}{dt} - k_{12}y_1 + k_{12}y_2\right\}\frac{1}{M_1}$$

For M_2,

$$M_2 \frac{d^2y_2}{dt^2} + k_{12}(y_2 - y_1) = 0$$

$$\Rightarrow M_2 \frac{d^2y_2}{dt^2} = -k_{12}(y_2 - y_1) \Rightarrow \frac{d^2y_2}{dt^2} = \left\{k_{12}y_1 - k_{12}y_2\right\}\frac{1}{M_2}$$

Taking Laplace transform

$$M_2 s^2 Y_2(s) + k_{12}Y_2(s) = k_{12}Y_1(s)$$

$$Y_2(s) = \frac{k_{12}}{M_2 s^2 + k_{12}} Y_1(s)$$

Laplace for Force $F(t) = 2\sin(10^n t)$

$$\Rightarrow F(s) = \frac{20}{s^2 + 100}.$$

For M_1 not to vibrate,

$$y_1(t) = 0$$

$$Y_1(s) = 0$$

$$Y_1(s) = \left[\frac{M_2 s^2 + k_{12}}{k_{12}}\right] Y_2(s) \Rightarrow k_{12} = -s^2 M_2$$

Put $s = j\omega \times 10$

$$k_{12} = -(j\omega \times 10)^2 M_2 = -(+j^2) \times 100 \times M_2 = 100 M_2 \text{ //.}$$