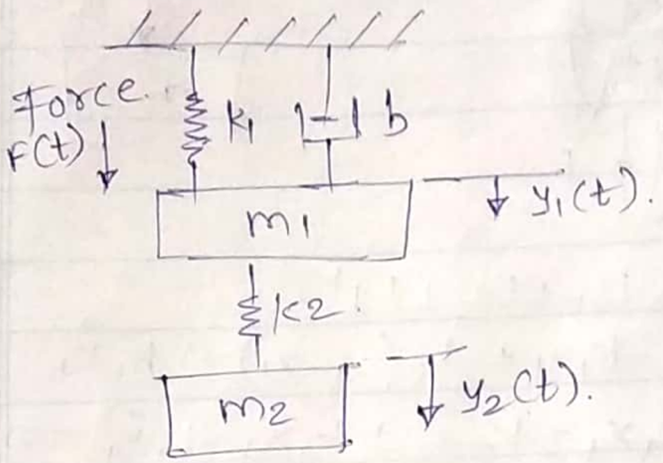
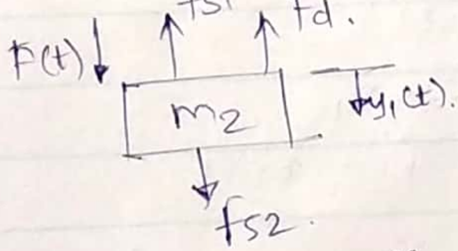



FBD for mass M1.




by $2^{nd}$ law of Newton.

$$\sum \vec{F} = ma.$$

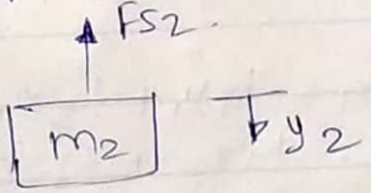
$$\therefore\ m_1\ddot{y}_1 = F(t) + F_{S2} \cancel{\mp} F_{S1} - F_d$$

$$m_1\ddot{y}_1 = F(t) + k_2(y_2 - y_1) - k_1 y_1 - b\dot{y}_1$$

$$\therefore\ m\ddot{y}_1 + k_1 y_1 + b\dot{y}_1 + k_2 y_1 = k_2 y_2 + F(t). \quad \text{—(1)}$$

first eq$^n$ of motion for ~~mass~~ $m_1$ system

FBD for mass m2.




by Newton's $2^{nd}$ law

$$\sum \vec{F} = ma.$$

$$m\ddot{y}_2 = -k_2(y_2 - y_1).$$

$$m_2\ddot{y}_2 + k_2 y_2 = k_2 y_1. \quad \text{—— (2)}$$

$2^{nd}$ eq$^n$ of motion. for system.

Calculations for selecting optimal value of $m_2$ & $k_2$.

$$\omega = \sqrt{\frac{K}{m}}$$ where $\omega$ = Natural frequency

∴ ~~for mass 1.~~

& $$\bar{m} = \frac{m_2}{m_1}$$ where $\bar{m}$ is mass ratio.

∵ mass Ratio decides the tolerance for excitation. Frequency. Greater the mass Ratio. greater freq. span to absorb. ∴ ideally $\bar{m}$ should be in between 0.2 to 0.5.

by taking $\bar{m} = 0.5$.

$$\bar{m} = \frac{m_2}{m_1}$$

$$0.5 = \frac{m_2}{100} = \boxed{m_2 = 50.}$$

∵ our excitation force has freq. 10 Rad/sec.

∴ $\cancel{f(t)}$ 2 sin (10t).

∴ for $\omega_f = 10$

$$\omega_f = \omega_2 = \sqrt{\frac{k_2}{m_2}}$$

$$10 = \sqrt{\frac{\cancel{50}\, k_2}{50}}$$

$$100 = \frac{k_2}{50}.$$

$$5000 = k_2.$$

$$\boxed{\therefore k_2 = 5000}$$

~~we can say $m_2 = 50$ & $k_2 = 5000$ are optimal valve.~~

∴ we can say $m_2 = 50$ & $k_2 = 5000$ are optimal value so that mass $m_1$ vibrates very negligible in steady state of Response.

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