

$$\Delta = (M_2 s^2 + k_{12}) (M_1 s^2 + b_s + k_1 + k_{12}) - k_{12}^2$$

$$\text{So, } f(t) = a \sin \omega_0 t = 2 \sin 10t$$

$$y_1(s) = \frac{a M_2 \omega_0 (s^2 + k_{12} / M_2)}{(s^2 + \omega_0^2) \Delta s}$$

For the motionless response,

$$s^2 + \frac{k_{12}}{M_2} = s^2 + \omega_0^2$$

$$\therefore \boxed{\omega_0^2 = \frac{k_{12}}{M_2}}$$