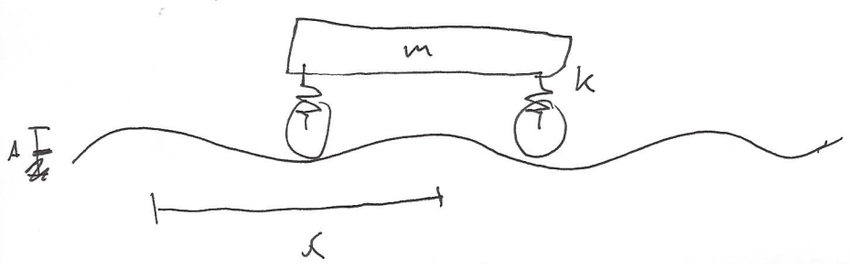
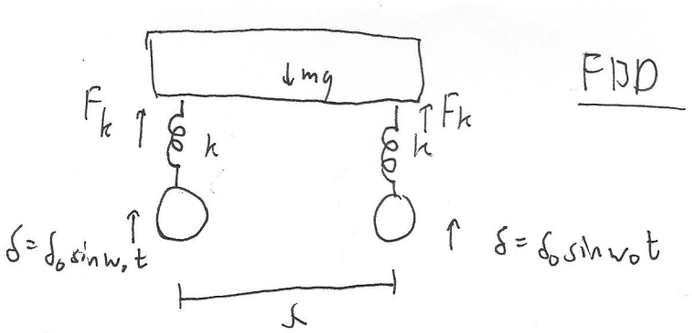
20-R-VIB-04-20 Intermediate

A 2000 kg car is driving across a bumpy road which can be described as a sinusoidal wave with an amplitude of 0.1 m and a wave length of 6 m. There are 4 springs, one for each wheel, and they all have a spring constant of 1000 N/m. Find the velocity of the car that will produce the greatest vibration.





FBD

Solution: $\delta_0 = 0.1m \quad \lambda = 6m \quad k = 4(1000) = 4000$

$$\omega_n = \sqrt{\frac{k}{m}} = \sqrt{2} \qquad \tau = \frac{2\pi}{\omega_n} = \frac{2\pi}{\sqrt{2}}$$

$\omega_0 = \omega_n$ for resonance

$\lambda = 6m$ in $\tau = \frac{2\pi}{2}\ s$

$$v = \frac{\lambda}{\tau} = 1.35\ m/s$$