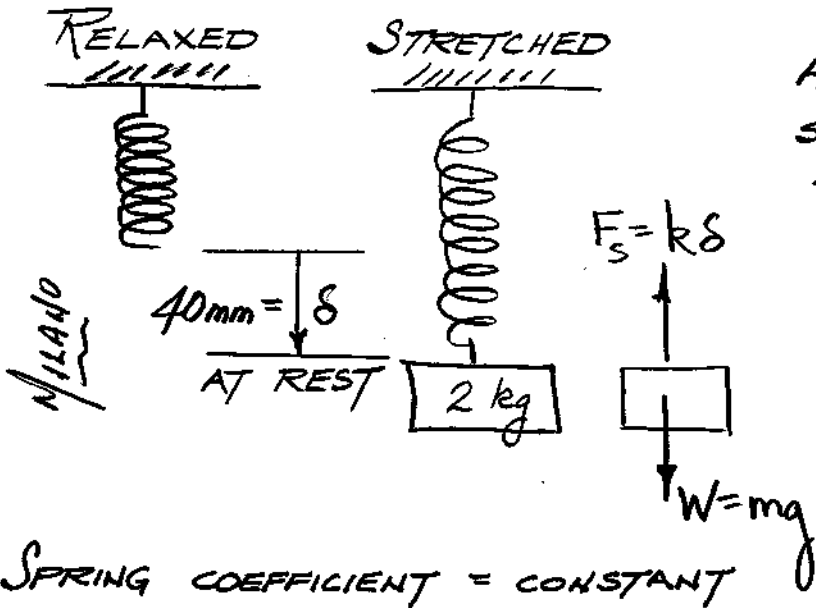


When a 2-kg block is suspended from a spring, the spring stretches 40mm.

DETERMINE:  $\omega_n = \text{NATURAL FREQ.}$  } FOR A  
 $P = \text{PERIOD}$  } 0.5 kg  
 block.



Add 2 kg and allow system to come to rest  $\therefore$  EQUIL.

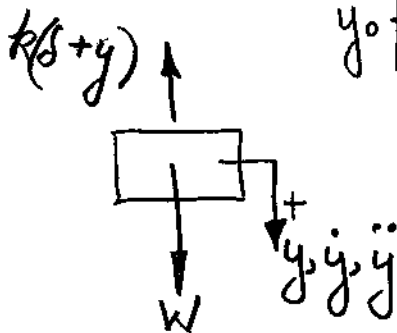
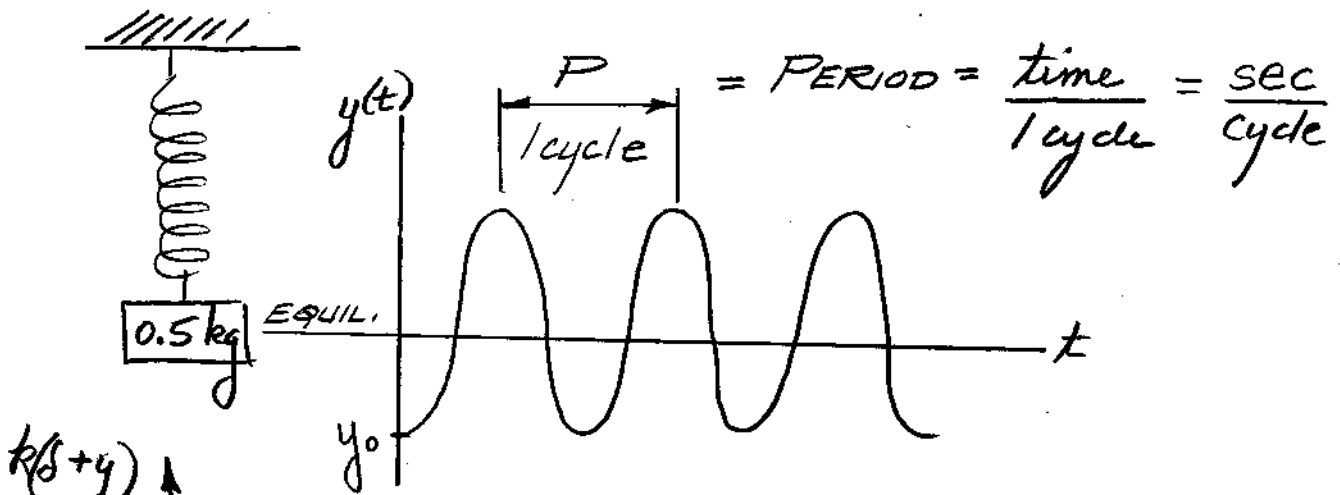
$$\sum F_{\text{on mass}} = 0$$

$$k\delta - mg = 0$$

$$k = \frac{(2 \text{ kg})(9.81 \frac{\text{m}}{\text{s}^2})}{.040 \text{ m}}$$

**$k = 490.5 \text{ N/m}$**

SPRING COEFFICIENT = CONSTANT



$$\sum F = ma$$

$$-k\delta - ky + mg = m\ddot{y}$$

$$0 = m\ddot{y} + ky = mD^2 + kD^0$$

$$D^2 = -\frac{k}{m} = \pm \sqrt{\frac{k}{m}} \hat{j} = \pm \omega_n$$

$$\omega_n = \sqrt{\frac{490.5 \text{ kgm}}{0.5 \text{ kg}} \frac{\text{m}}{\text{s}^2}} = \boxed{31.32 \frac{\text{rad}}{\text{s}}} \times \frac{1 \text{ cycle}}{2\pi \text{ rad}} = f = 4.98 \frac{\text{c}}{\text{s}}$$

**$P = \frac{1}{f} = 2 \frac{\text{s}}{\text{cycle}}$**  for  **$f \approx 5 \text{ cps}$**