

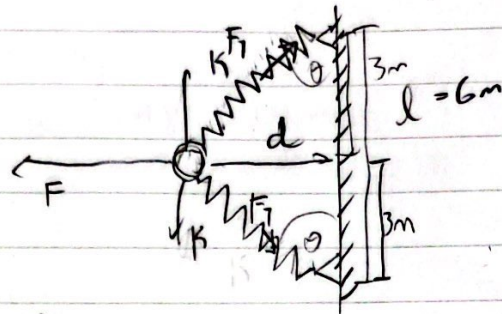
problem 1)

The springs AB and BC have stiffness K and an unstretched length of l . Determine the displacement d of the cord from the wall when a force F is applied to the cord.

$$F = 175 \text{ N}$$

$$K = 500 \text{ N/m}$$

$$l = 6 \text{ m}$$



let x be the length of the spring

$$\sum F_x = 0$$

$$0 = (2)(F_s)(\cos \theta) - 175$$

$$\cos \theta = \frac{d}{x+3}$$

$$87.5 = (F_s)(\cos \theta)$$

$$87.5 = (15)(x)(\sin \theta)$$

$$d^2 + 3^2 = (x+3)^2$$

$$87.5 = (500)(x)(\sin \theta)$$

$$\sqrt{d^2 + 3^2} = x+3$$

$$87.5 = (500)(x)\left(\frac{d}{x+3}\right)$$

$$\sqrt{d^2 + 49} - 3 = x$$

$$87.5 = (500)(\sqrt{d^2 + 9} - 3)\left(\frac{d}{\sqrt{d^2 + 9}}\right)$$

$$\frac{87.5}{500} = (\sqrt{d^2 + 9} - 3)\left(\frac{d}{\sqrt{d^2 + 9}}\right)$$

$$\text{using Desmos } d = 1.55687 \text{ m}$$

$$d = 1.56 \text{ m}$$

\therefore Displacement of the cord from the wall is 1.56 m

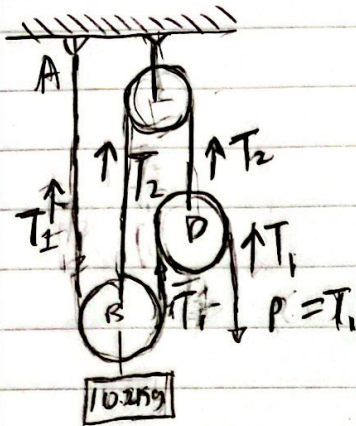
0.175

$$87.5d^2 + 9(0.175) = \sqrt{d^2 + 9} - 3 = 500d^2$$

$$d^2 = (87.5^2 - 9(0.175)^2) / (500^2 - 87.5^2)$$

problem 2)

determine the force P needed to support the 10.2 kg weight. Each pulley has a weight of 1.02 kg. Determine the cord reactions at A and B.

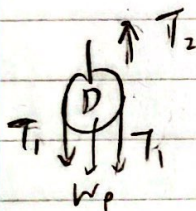


$$w = 1.02 \text{ kg}$$

$$w = 10.2 \times 9.81 = 100.062 \text{ N}$$

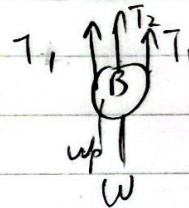
$$w_p = 1.02 \times 9.81 = 10.0062 \text{ N}$$

Joint D



$$\begin{aligned} 2T_2 &= T_1 \\ 2T_2 &= 10.0062 + 2T_1 \end{aligned}$$

Joint B



$$\textcircled{1} \quad 2T_1 + T_2 = 110.0682$$

Solve system of equations $\textcircled{1}$ $\textcircled{2}$ at B

$$2T_1 + (10.0062 + 2T_1) = 110.0682$$

$$4T_1 = 100.062$$

$$T_1 = 25.0155 \text{ N}$$

$$T_1 = 25.0 \text{ N}$$

$$T_2 = 10.0062 + 2T_1 = 60.0372 \text{ N} \approx 60.0 \text{ N}$$

\therefore Cord reaction at A = 25 N, cord reaction at B = 60.0 N