

20-P-WE-AF-011

Power and Efficiency: Advanced

Q: A collar with a mass of M kg starts from rest at A and moves along smooth rod by applying a constant force of $F = 4\text{ N}$ to the rope. What is the power generated when the angle is θ .

— assume this is before the curve starts —

A: $W = M \cdot g$

$$\sum_0^1 T_1 + \sum U_{A \rightarrow B} = T_2$$

$$\sum U_{A \rightarrow B} = -W(y_1 - y_2) + F(L_1 - L_2)$$

$$L_1 = \sqrt{(l_1 + r)^2 + (l_2 + r)^2}$$

$$y_1 = 0$$

$$L_2 = \frac{r + l_2}{\sin \theta}$$

$$y_2 = \frac{r + l_2}{\tan \theta}$$

$$0 + \sum U_{A \rightarrow B} = \frac{1}{2} m v_2^2$$

$$\sqrt{\frac{2}{m} \sum U_{A \rightarrow B}} = v_2$$

$$P = F \cdot v \cos \theta$$

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