

LAST Name:

ANSWERS-

First Name:

Student Number:

**MIE 200F - Quiz number 4b – October 11, 2001**  
**quiz duration = 25 minutes**

The small slider of mass 15 kg moves from "B" to "C" along a frictionless rod. A constant force  $P = 80$  Newtons is being applied to the rope in the direction shown. The spring has a relaxed length of 100 mm, and a stiffness of  $k = 200$  N/m.

- (a) Find the work done by the spring on the slider as the slider moves from "B" to "C".  
 (b) Find the work done by the rope on the slider as the slider moves from "B" to "C".  
 (c) Find the work done by gravity on the slider as the slider moves from "B" to "C".

$$T_2 = T_1 + U_{1 \rightarrow 2}$$

$$g = 9.81 \text{ m/s}^2 \downarrow$$

$$U_{\text{spring}} = \frac{1}{2} k (x_1^2 - x_2^2)$$

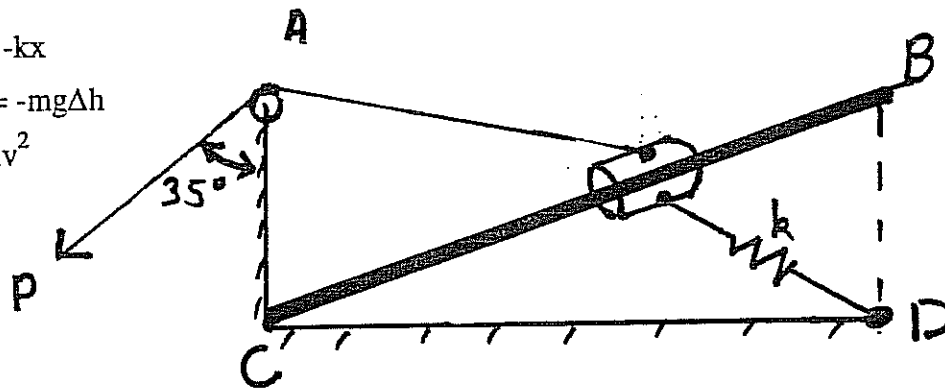
$$F_{\text{spring}} = -kx$$

$$U_{\text{gravity}} = -mg\Delta h$$

$$T = \frac{1}{2} mv^2$$

$$CD = 0.4 \text{ m}$$

$$AC = BD = 0.2 \text{ m}$$



$$\begin{aligned} (a) \quad U &= \frac{1}{2} k (x_1^2 - x_2^2) \\ &= \left(\frac{1}{2}\right)(200) ([.2 - .1]^2 - [.4 - .1]^2) \\ &= 100 (.01 - .09) = -8 \text{ Joules} \end{aligned}$$

$$\begin{aligned} (b) \quad U &= \int \vec{P} \cdot d\vec{s} = (P)(.4 - .2) \\ U &= (80)(.2) = 16 \text{ Joules} \end{aligned}$$

$$\begin{aligned} (c) \quad U &= -mg\Delta h \\ U &= -(15)(9.81)(-0.2) = 29.43 \text{ Joules} \end{aligned}$$