Chapter 14 - 5

Conservation of Energy

$Energy_1 = Energy_2 + Friction$

Miami University

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Objectives

- Establish a standard energy equation
- Establish initial and final conditions
- Solve for unknown variable

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Types of Energy

- Work $U = (F) \times (s)$
- Spring Work $SP = (½)kx^2$
- Potential Energy $PE = W \times h$
- Kinetic Energy $KE = (½)mv^2$
- Friction Work $Fr = F_f \times (s)$

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Conservation of Energy

Energy at condition (1) equals Energy at condition (2) plus friction

$$KE_1+PE_1+SP_1=KE_2+PE_2+SP_2+Fr$$

$$(½)mv_1^2+Wh_1+(½)kx_1^2 = (½)mv_2^2+Wh_2+(½)kx_2^2+F_f(\Delta x)$$

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Example 14 – 10

Conditions:

v_1=20 ft/s v_2 = 0 ft/s

h_1 = 0 ft h_2 = d(sin 30)

No spring component

Friction = 5 lbs

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Example 14 – 10 Solution

$$(½)(W/g)v_1^2+Wh_1+(½)kx_1^2 = (½))(W/g)\,v_2^2+Wh_2+(½)kx_2^2+F_f(\Delta x)$$

(Remove factors that equal zero)

$$(½)(W/g)v_1^2 = Wh_2+F_f(\Delta x)$$

(Substitute values)

$$(.5)(100/32.2)(20)^2=(100)(d)(.5)+(5)(d)$$

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Example 14 – 10 Answer

$(.5)(100/32.2)(20)^2=(100)(d)(.5)+(5)(d)$

$621=50d+5d$

$d=11.3$ ft

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Angular Kinetic Energy

- Rectilinear KE = $(½)mv^2$
- Angular KE = $(½)I\omega^2$
- Where:
  - KE in ft-lbs or n-m
  - I in ft-lb-s^2 or kg-m^2
  - ω in rad/sec

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Week 12 Homework

- Chapter 14
  - Problems: 26, 27, 35, 37, 43, 50 & 59 (7^{th} Ed)
  - Problems: 29, 30, 38, 40, 46, 53 & 62 (8^{th} Ed)
- Read Sections 14 - 7 thru 14 - 9 for next week

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