Exam 2 Review Notes

Chapter 6

Category I

> **Key:**
> - **Category I:** most important stuff. Definitely on exam.
> - **Category II:** less important, but still "fair game." *Could* be on exam.
> - **Category III:** definitely *not* on exam.

- Sec. 6-3: Equilibrium (at least 1 question on this)
  - $\sum F_x = 0$ and $\sum F_y = 0$ … apply these.
  - Problems like:
    - traffic light (done in class)
    - Prob. 65, HW
    - #3, Practice Exam
    - Example 6-5
    - Active Example 6-2
- Sec. 6-1: Friction Forces (at least 1 question on this)
  - $f_s \le \mu_s N$
  - $f_k = \mu_k N$
  - Problems like:
    - Example 6-3.
    - Car on flat circular road (#2, Practice Exam)
    - Car on *banked* circular road
    - Prob. 2, HW
- Sec. 6-5: Circular Motion (at least 1 question on this)
  - Problems like:
    - Car on flat circular road (#2, Practice Exam)
    - Car on *banked* circular road
    - Ball on string, swung in horizontal circle (done in class)
    - #4, Practice Exam

Category II

- Sec 6-4: Connected Objects
  - Problems like:
    - #16, Practice Exam
    - Prob. 36, HW
    - Prob. 37, book
- Hooke's law (Sec. 6-2)
  - Problems like:
    - Prob. 23, HW
    - Prob. 16, book
    - Prob. 19, book (done in class)

Category III

- Sec 6-2: Strings & Springs (except for Hooke's law)

Chapter 7

Category I

- Sec 7-1: Definition of Work (1 prob. on this)
  - $W \equiv Fd\cos\theta$
  - Problems like:
    - #5, Practice Exam
    - Example 7-1
    - Example 7-2
    - Prob. 9, HW
- Sec 7-2: Work-energy theorem (1 prob. on this)
  - $W_{net} = \Delta K$
  - Problems like:
    - Example 7-6 (done in class)

    - #6, Practice Exam
    - Prob. 21, HW

Category II

- Kinetic Energy (Sec 7-2)
    - $K \equiv \frac{1}{2}mv^2$
    - could be something kind of "conceptual"… like #12, Practice Exam

Category III

- Sec 7-3: Work done By Variable Force
- Sec 7-4: Power

Chapter 8

Category I

- Conservation of Energy (Sec 8-3)… at least 2 questions on this!
    - ❖Could be conservation of energy *without* a spring or *with* a spring!
    - Conservation of Energy Without Spring:
        - $E_f = E_i$ (if no nonconservative forces doing work)
        - $E_i = K_i + U^i_{grav} = \frac{1}{2}mv_i^2 + mgy_i$
        - $E_f = K_f + U^f_{grav} = \frac{1}{2}mv_f^2 + mgy_f$

          } Note: no K_{rot} for this exam… just K_{trans}
        - Problems like:
            - person on slide (done in class)
            - #8, Practice Exam
            - #17, Practice Exam
            - Example 8-7
    - Conservation of Energy With Spring:
        - $E_f = E_i$ (if no nonconservative forces doing work)
        - $E_i = K_i + U^i_{grav} + U^i_{spring} = \frac{1}{2}mv_i^2 + mgy_i + \frac{1}{2}kx_i^2$
        - $E_f = K_f + U^f_{grav} + U^f_{grav} = \frac{1}{2}mv_f^2 + mgy_f + \frac{1}{2}kx_f^2$
        - Problems like:
            - Example 8-8 (similar to example done in class)
            - #9, Practice Exam
            - #10, Practice Exam
            - #11, Practice Exam
            - Prob. 18, HW

Category II

- Sec 8-1: Conservative and Nonconservative Forces
    - know *definitions* of conservative and nonconservative forces (the ones I gave in class, not the ones in the book):
        - a *conservative force* is one which, when it acts *alone* on an object (or system of objects), does *not* change the total mechanical energy of the object (or system).
        - a *nonconservative force* is one which *does* change the total mechanical energy, *if* it does any *work*.
    - ❖ Be able to *state* these in writing or pick them out from a list of statements.

- Gravitational Potential Energy (Sec 8-2)
  - $U_{grav} \equiv mgy$
  - Problems like:
    - #7, Practice Exam
    - Prob. 12, HW

Category III

- Sec 8-4
- Sec 8-5

Chapter 9

Category I

- Conservation of Linear Momentum and Collisions (Secs 9-4, 9-5, 9-6)
  - Collisions
    - 2 broad categories: *head-on* and *glancing* (probably at least 1 question on each)
    - head-on collisions:
      - elastic: $\vec{p}$ conserved, K conserved
        - $m_1 v_{1i} + m_2 v_{2i} = m_1 v_{1f} + m_2 v_{2f}$ (p cons.)
        - $v_{1i} + v_{1f} = v_{2i} + v_{2f}$ ("other" eq…. derived in class)
        - Problems like:
          - #15, Practice Exam
          - 2 billiard balls, equal masses (done in class)
          - 2 billiard balls, different masses (done in class)
          - Prob. 35, HW
      - inelastic: $\vec{p}$ conserved, K not
        - $m_1 v_{1i} + m_2 v_{2i} = m_1 v_{1f} + m_2 v_{2f}$ (p cons.)
      - completely inelastic: $\vec{p}$ conserved, K not, objects stick together
        - $m_1 v_{1i} + m_2 v_{2i} = (m_1 + m_2) v_f$ (p cons.)
        - Problems like:
          - railroad cars (done in class)
          - two gliders on air track, one with "pin", other with "wax cylinder" (done in lab)
          - Prob. 23, HW
    - glancing collisions:
      - $\vec{p}$ still conserved, but *can't* write: $m_1 v_{1i} + m_2 v_{2i} = m_1 v_{1f} + m_2 v_{2f}$!
      - Instead, write $\vec{p}$ conservation as:
        - $p_{xi} = p_{xf}$
        - $p_{yi} = p_{yf}$
      - Problems like:
        - #18, Practice Exam
        - Example 9-6 (done in class)

Category II

- "Explosions" … situations where $\vec{p}_i = \vec{0}$. Something "blows up"… one part goes one way, other part *recoils* in opposite direction.
  - Problems like:
    - "stick of dynamite" problem (done in class)
    - #14, Practice Exam

- Prob. 19, HW
- Prob. 20, HW

Category III

- Sec 9-3
- Sec 9-7
- Sec 9-8