PHYS 201    Study Guide For Test #4     Chapters 16 & 17

Equations that will be provided are listed with (given). You should know all other equations.

Chapter 16: Waves and Sound  
1. Waves: Define and give examples for transverse wave, longitudinal wave, and both.  
2. Periodic wave:   
        a. Define periodic wave, period (T), frequency (f), wavelength (λ), and wave speed.   
        b. Show a periodic wave as a function of time and distance.  
        c. You must know the following equations:

 

3. Speed of a wave on a string: The **speed of a wave** depends on the properties of the medium in which the wave travels. For a transverse wave on a string that has a tension *FT* and a mass per length *m*/*L*, the wave speed is, (which will be given):

 (given)

4. The nature of sound waves in air: Type, frequency, intensity, and wave form.

, I0 = 10-12 W/m2. (given)

5. Doppler effect: The **Doppler effect** is the change in frequency detected by an observer because the sound source and the observer have different velocities with respect to the medium of sound propagation. If the observer and source move with speeds *v*o and *v*s, respectively, and if the medium is stationary, the frequency *f*o detected by the observer is,

 (given)

Chapter17

The **principle of linear superposition** states that when two or more waves are present simultaneously at the same place, the resultant disturbance is the sum of the disturbances from the individual waves. **Constructive interference** occurs at a point when two waves meet there crest-to-crest and trough-to-trough, thus reinforcing each other. **Destructive interference** occurs when the waves meet crest-to-trough and cancel each other. When the waves meet crest-to-crest and trough-to-trough, they are **exactly in phase.** When they meet crest-to-trough, they are **exactly out of phase.**

**Diffraction** is the bending of a wave around an obstacle or the edges of an opening. The angle through which the wave bends depends on the ratio of the wavelength (λ) of the wave to the width (D) of the opening; the greater the ratio *λ*/*D*, the greater the angle.

**Beats** are the periodic variations in amplitude that arise from the linear superposition of two waves that have slightly different frequencies. When the waves are sound waves, the variations in amplitude cause the loudness to vary at the **beat frequency,** which is the difference between the frequencies of the waves.

A transverse or longitudinal **standing wave** is the pattern of disturbance that results when oppositely traveling waves of the same frequency and amplitude pass through each other. A standing wave has places of minimum and maximum vibration called, respectively, **nodes** and **antinodes.**

A **complex sound wave** consists of a mixture of a fundamental frequency and overtone frequencies.

Problem solving with transverse and longitudinal standing waves.

Study Guide for Final Exam:   
 Materials from T1, T2, and T3.