

## Practice Exam # 4 – Physics 152

April 27, 2008

Be sure to include pictures, coordinate systems, etc. where reasonable. Be explicit about what arguments you are using when determining a physical quantity, (e.g.  $\vec{E}$ ).

1. A vertical spring stretches  $9.6\text{cm}$  when a  $1.3\text{kg}$  block is hung from its end.
  - (a) Calculate the spring constant.
  - (b) This block is then displaced an additional  $5\text{cm}$  downward and release from rest. Find the period of oscillation.
  - (c) Find the frequency of oscillation.
  - (d) Find the amplitude of oscillation.
  - (e) Find the maximum speed of the oscillation.

2. The linear density of a string is  $1.6 \times 10^{-4}\text{kg/m}$ . A transverse wave on the string is described by the equation

$$y(x, t) = (2.0\text{mm}) \sin[(2.0\text{rad/m})x + (30\text{rad/s})t] \quad (1)$$

What is the wave speed and tension in the string?

3. String  $A$  is stretched between two clamps separated by a distance  $L$ . String  $B$ , with the same linear density and under the same tension as  $A$ , is stretched between two clamps separated by distance  $4L$ . Consider the first eight harmonics of string  $B$ . Which, if any, has a resonant frequency that matches a resonant frequency of string  $A$ ?
4. For both of the following assume the air and (fresh) water are at  $20^\circ\text{C}$ 
  - (a) If two sound waves, one in air and one in (fresh) water, are equal in intensity, what is the ratio of the pressure amplitude of the wave in water to that of the wave in air?
  - (b) If the pressure amplitudes are equal instead, what is the ratio of the intensities of the waves?
5. The  $A$  string of a violin is a little too tightly stretched. Four beats per second are heard when the string is sounded together with a tuning fork that is oscillating accurately at concert  $A$  ( $440\text{Hz}$ ). What is the period of the violin string oscillation?