EF 152 Exam #2, Spring, 2013

Name: ___________________________ Section: ________

Guidelines:
• Assume 3 significant figures for all given numbers unless otherwise stated
• Show all of your work – no work, no credit
• Write your final answer in the box provided - include units for all answers
• If you finish with less than 5 minutes remaining, remain seated until the end of the exam and all exams are collected.

1. (2 pts) How many decibels are in one bel?
   a. 1/100  b. 1/10  c. 1  d. 10  e. 100

2. (2 pts) A mass on a spring in simple harmonic motion has amplitude A and period T. What is the total distance traveled by the mass after a time interval T?
   a. 0  b. A/2  c. A  d. 2A  e. 4A

3. (2 pts) Consider a wave on a string moving to the right. What is the direction of the velocity of a particle at the point labeled B?
   a.  b.  c.  d.  e. zero

4. (2 pts) A tuning fork produces a steady tone of 440 Hz. When struck and held near a vibrating guitar string, twenty beats are counted in 5 seconds. The possible frequencies produced by the guitar string are:
   a. 420 Hz, 460 Hz  b. 436 Hz, 444 Hz  c. 435 Hz, 445 Hz  d. 440 Hz

5. (4 pts) The ninth harmonic of an organ pipe is 1500 Hz. What is the frequency of the third harmonic?
6. (4 pts) A cuckoo clock keeps time by having a mass bouncing on a spring. What spring constant is needed to produce a period of 0.500 sec for a 0.0175 kg mass?

7. (12 pts) A violin string weighs $1.65 \times 10^{-3}$ lb and is 1.2 ft long. The third harmonic is 882 Hz. Determine the tension in the string.

8. (12 pts) An earthquake causes Estabrook Hall to vibrate in simple harmonic motion at 6.2 Hz. The initial displacement is 0.55 inches and the initial velocity is 18 in/sec. Determine the maximum acceleration in g's.

9. (12 pts) A pipe organ is left in the cold where the air temperature is -12°C. Determine the length of a closed pipe needed to produce a fundamental frequency of 110 Hz in this cold location.
10. (12 pts) A violin weighs 0.4 kg and oscillates about the top with a period of 2.22 sec. A violin is 60 cm long and its center of mass is located 12 cm from the bottom. Determine the mass moment of inertia about its center of mass.

11. (12 pts) You are driving east at 65 mph. A fire truck is coming towards you heading west at 80 mph. Its siren blares at 460 Hz. Determine the frequency you hear. Assume the speed of sound is 767 mph.

12. (12 pts) Eight trombone players produce a sound level of 112 dB. If each trombone player produces the same intensity, what is the sound level in decibels of one trombone player?

13. (12 pts) A scuba diver training in a pool looks at his instructor as shown. The angle of incidence is 36°. Determine the height of the instructor, \( h \). \( \n_{\text{water}} = 1.33 \), \( \n_{\text{air}} = 1.0 \).