Hw-CHAPTER-18 (Dr. Gondal Phys.25-27)

First Major T-042

1)In a liquid having density 1.30*10**3 kg/m**3, longitudinal waves with frequency of 400 Hz are found to have a wavelength of 8.0 m. Calculate the bulk modulus of the liquid. A1 1.33*10**10 Pa.

HW☞2) An ambulance emits sound of frequency 300 Hz and is moving with a speed of 45.0 m/s away from a moving car. If the car is moving towards the ambulance with a speed of 15.0 m/s, what frequency does a person in the car hear? [The speed of sound in air is 343 m/s].A1 277 Hz.

HW☞3) A person is hearing a sound level of 70 dB at a distance of 3.0 m from a point source. Assuming that the sound is emitted isotropically, find the power of the source.A1 1.1*10**(-3) W.

4) The frequency of the fundamental mode of a sound wave in a 30.0-cm long tube closed at one end is 256 Hz. When the tube length is shortened to 12.0-cm, what is the new fundamental frequency?A1 640 Hz.

HW☞5) In figure 1, two speakers, A and B, are driven by the same oscillator at a frequency of 170 Hz and face each other at a distance of 2.0 m. What is the number of minima along the line joining the two sources? [Consider only the nodes between the two sources.][Take the speed of sound in air = 340 m/s] A1 2

First Major T-001

HW☞1) A point source uniformly radiates 440 W of sound in all directions. How far, from the source, will the intensity level be 106 dB? (001) Ans: 29.7 m

HW☞2) During a time equal to the period of a certain vibrating fork, the emitted sound wave travels a distance: Ans: of one wavelength.

HW☞3) A train approaches a mountain at a speed of 75 km/hr. The train's engineer sounds a whistle that emits a frequency of 420 Hz. What will be the frequency of the echo that the engineer hears reflected off the mountain?(The speed of sound in air = 343 m/s) . Ans 474 Hz

HW☞4) Organ pipe A, with both ends open, has a fundamental frequency of 30 Hz. The third harmonic (n=3) of organ pipe B, with one end open, has the same frequency as
the second harmonic (n=2) of pipe A. How long is pipe B?(The speed of sound in air = 343 m/s) . Ans: 4.3 m .

First Major T-012

HW☞1)Pipe A, which is 1.8 m long and open at both ends, oscillates at its third lowest harmonic frequency. Pipe B, which is closed at one end, oscillates at its second lowest harmonic frequency. The frequencies of pipes A and B match. They are both filled with air for which the speed of sound is 344 m/s. How long is pipe B? Ans 0.9 m

2)A sinusoidal sound wave is described by the displacement
S (x,t) = 2*10**(-8) cos [1.25 x - 1850 t],
where x is in meters and t is seconds. What is the pressure amplitude of this wave if it is traveling in a material with a bulk modulus of 2.1*10**9 N/m**2 ? Ans: 52.5 Pa

HW☞3)Two sound waves, from two different sources with the same frequency, 540 Hz, travel in the same direction at 344 m/s. The sources are in phase. What is the phase difference of the waves at a point that is 4.40 m from one source and 4.00 m from the other source? Ans: 3.95 rad

HW☞5) A sound source located at the origin emits sound with an average power of 0.04 W. Two detectors are located on the positive x-axis. Detector A is at x = 3.0 m and detector B is at 5.0 m. What is the difference in sound level between A and B? Ans: 4.4 dB

First Major T-031

1)Two transmitters, S1 and S2 shown in figure (1), emit identical sound waves of wavelength lambda. The transmitters are separated by a distance lambda/2. Consider a big circle of radius R with its center halfway between these transmitters. How many interference maxima are there on this big circle? Ans: 2.

2) `Sound waves are not:` A1 transverse waves. A2 pressure waves. A3 compression waves. A4 longitudinal waves. A5 mechanical waves.

3)A person closes his windows to reduce the street noise from 10**(-4) W/m**2 to 10**(-8) W/m**2. What is the change in the intensity level in dB? Ans: 40.

HW☞4) A stationary observer hears a frequency of 760 Hz of a whistle of a train moving at a speed of 40 m/s towards him. If the train is moving away with the same speed, then the frequency detected by the observer will be: [Take the speed of sound in air = 340 m/s]. Ans: 600 Hz.

HW☞5) Organ pipe A, with both ends open, has a fundamental frequency of 340 Hz and length 0.4 m. The third harmonic of organ pipe B, with one end open, has the same frequency as the second harmonic of pipe A. How long is pipe B? Ans: 0.3 m.

First Major T-002

1)Two transmitters, S1 and S2 in figure (1), emit sound waves ofwavelength lambda. The transmitters are separated by a distance lambda. Consider a big circle of radius R with center halfway between these transmitters. How many interference minima (i.e.completely silent positions) are there on this big circle? Ans: 4.

2)A man strikes a long steel rod at one end. Another man, at the other end with his ear close to the rod, hears the sound of the of the blow twice (one through air and once through the rod),with a 0.1 seconds interval between. How long is the rod?[For the steel, the bulk modulus = 2.1*10**11 Pa, and the density = 7.0*10**3 kg/m**3. Speed of sound in air = 340 m/s.]Ans: 36 m.

3) If two successive frequencies of a pipe, closed at one end and filled by air, are 500 Hz and 700 Hz, the length of the pipe is:[speed of sound in air = 340 m/s]

Ans: 0.85 m.

HW☞4) If the distance from a source of sound increases by 1 meter, the sound level is decreased by 2 dB. Assume the loudspeaker that is emitting this sound emits sound in all directions. The original distance from the sound source is: Ans 3.86 m.

5) An ambulance siren emits a sound of frequency 1.60 kHz.

A person running with a speed of 2.50 m/s hears a frequency of 1.70 kHz as the ambulance approaches him from the back. How fast is the ambulance moving? (speed of sound is 340 m/s).Ans: 22.4 m/s.