Old-Exam. Questions-Ch.17

Q5. A pipe has two consecutive resonance frequencies of 600 Hz and 1000 Hz. One end of the pipe is closed. What is the fundamental frequency of the pipe? (Ans: 200 Hz)
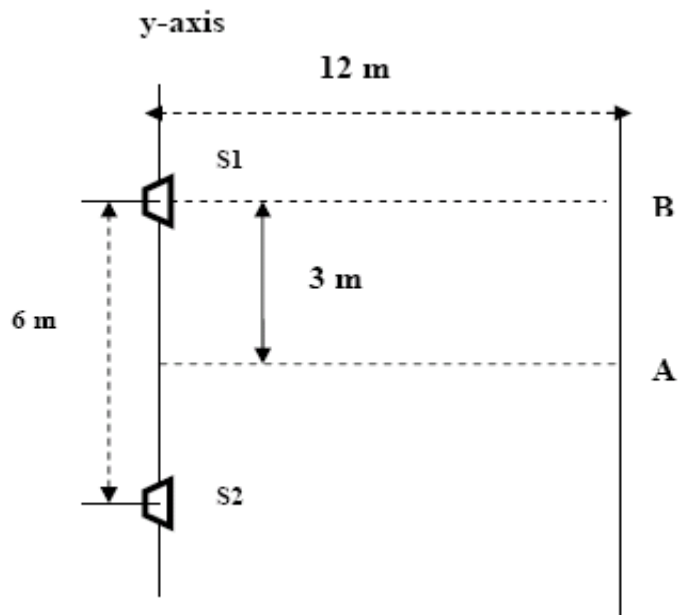
Q6. The intensity of sound emitted by a source is doubled. What is the change in intensity level of the sound? (Ans: 3.0 dB)

Q7. Two identical loudspeakers, facing each other, are in phase and each has a frequency of 85 Hz. A man at the midpoint between the two loudspeakers moves slowly toward one of them until he hears the first minimum in sound. How far did he move? (The speed of sound in air = 340 m/s) (Ans: 1.0 m)

Q8. If it were possible for a man to move with the speed of sound directly toward a stationary whistle emitting a sound of frequency f, he would hear (Ans: a sound of frequency $2f$)

T072
Q6.Two speakers S1 and S2 are placed on the y-axis as shown in figure 1. The speakers are in phase and emit identical sound waves with a given frequency. An observer, standing at point A, hears a sound of maximum intensity. As the observer moves along a straight line parallel to the y-axis and reaches point B, he hears first minimum of sound intensity. The frequency of sound emitted by the speakers is? (speed of sound in air = 343 m/s). (Ans: 121 Hz)
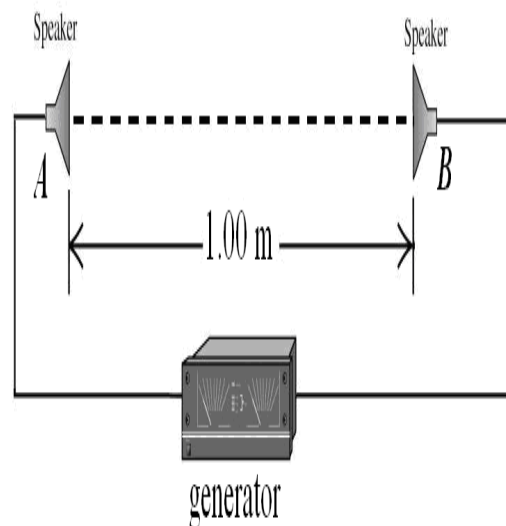
Q7. A stationary train passenger hears a frequency of 520 Hz as a train approaches a bell on a trackside safety gate. After the train passes the gate the passenger hears a frequency of 480 Hz for the bell sound. The speed of the train is : (speed of sound in air = 343 m/s) (Ans: 13.7 m/s)

Q8: The intensity of a certain sound wave is 6 mW/cm². If its sound level is raised by 10 decibels, the new intensity (in mW/cm²) is: (Ans: 60)

Q9. If the speed of sound is 340 m/s, the two lowest resonance frequencies of a 0.5 m organ pipe, closed at one end, are approximately: (Ans: 170 and 510 Hz)

T071

Q5. In the figure below, two speakers are driven by the same generator and are a distance of 1.0 m apart. The speakers emit sound waves at a frequency of 686 Hz that are in phase. A listener starts at A and moves toward B. What will be the distance from A of the first point at which he will observe constructive interference? The speed of sound in air is 343 m/s. (Ans: 0.25 m)

Q6. A standing wave is set up in an air-filled tube that is closed at one end. The standing wave has two nodes and the frequency of oscillation is 230 Hz. What is the length of the tube? Take the speed of sound to be 343 m/s. (Ans: 1.1 m)

Q7. The average output power of a speaker is 550 watts. The sound level that reaches to a detector is 105 dB, how far is the detector from the source? (Take $I_0 = 10^{-12}$ W/m²) (Ans: 37 m)

Q8. A stationary policeman sends a sound wave of frequency 550 Hz towards a car approaching him. The reflected frequency detected by the policeman is 620 Hz. What is the speed of the car? (Ans: 20 m)

T062:

Q6. A 2.5 m long tube, open at both ends, is filled with a gas. The frequency of a certain harmonic is 500 Hz and the frequency of the next harmonic is 600 Hz. What is the speed of sound in the tube? (Ans: 500 m/s)
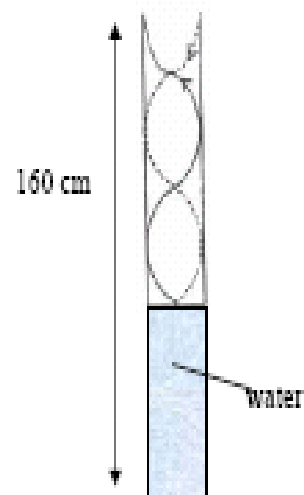
Q7. The intensity of a sound wave of frequency 360 Hz is 1.6×10^{-6} W/m^2. If the speed of sound in air is 343 m/s, what is the displacement amplitude of the air molecules oscillation caused by this wave? ($\rho_{air}=1.21$ kg.m^3). (Ans: 3.88×10^{-8} m)

Q8. A person is listening to sounds from two different sources simultaneously. One source has sound level of 80 dB, while the other has 90 dB. What combined sound level will the person hear? (Ans: 90.4 dB)

Q9. Two trucks are heading straight toward each other with the same speed "U". The horn of one, with frequency $f_s = 3000$ Hz, is blowing, and is heard to have a frequency of 3200 Hz by the people in the other truck. Find "U" if the speed of sound is 340 m/s. (Ans: 11 m/s)

T061:
Q5. Sound waves of frequency 340 Hz are sent into the top of a vertical tube containing water, as shown in the figure 1. If standing waves are produced, as shown, what is the height level of the water?. [Speed of sound in air = 340 m/s] (Ans: 35 m)

160 cm

water

Q6. A man strikes one end of a long steel pipe of length *L,* filled with water, by a hammer. A detector attached to the other end of the pipe receives two sounds signals, one from the wave that travels through the pipe and the other from the wave that travels through the water. If the time difference between the two wave signals is 0.02 s, what is the length of the pipe? (Speeds of sound in steel and water are V$_s$ = 5940 m/s and V$_w$ = 1480 m/s, respectively). (Ans: 39 m)

Q7. The intensity of a sound wave is 10^{-7} W/m^2 at a distance of 30.0 m from a speaker emitting sound waves at a the frequency of . What is the sound level at a distance of 50.0 m from the speaker? (Ans: 46 dB)

Q8. A truck emits sound with a frequency of 620 Hz. A person is riding a bike that moves at a speed of 3.0 m/s and is following the truck. If the person hears a frequency of 560 Hz, how fast is the truck moving? (Take the speed of sound in air as 343 m/s). (Ans: 40 m/s)
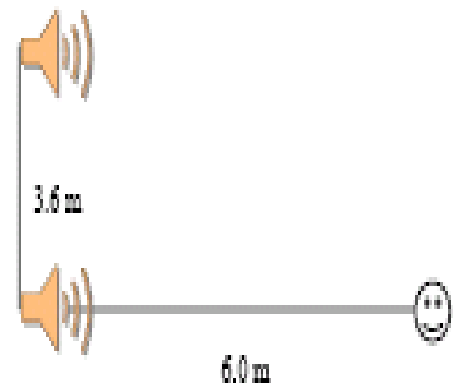
T052:
Q1. A pipe open at both ends has a fundamental frequency of 400 Hz. What will be the fundamental frequency if the pipe is closed at one end? (speed of sound is 340 m/s) (Ans: 200 Hz.)

Q4. The sound level of a certain sound source is increased by 40 dB. By what factor is the displacement amplitude increased? (Ans: 100)

Q13. A stationary person hears a frequency of 800 Hz of an ambulance siren moving at a speed of 60 m/s towards him. What frequency will he hear when the ambulance is moving away from him with the same speed. [speed of sound in air is 340 m/s]. (Ans: 560 Hz).

Q11. Two speakers are separated by a distance of 3.6 m. A listener is standing in front of one speaker at a distance of 6 m, as shown in Fig. 1. The transmitted sound waves by both speakers are in phase and are in the audible range. What is lowest frequency at which a listener will hear a minimum intensity (speed of sound in air is 340 m/sec)? (Ans: 170 Hz)
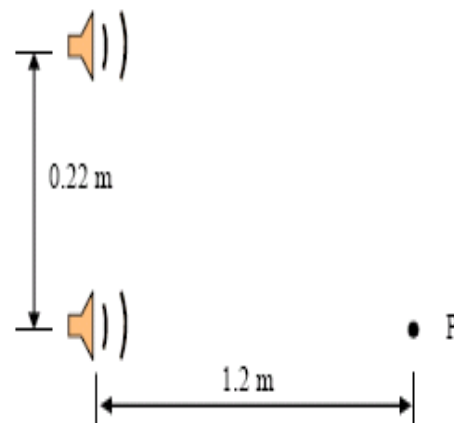

T051:
Q5. The sound level at a distance of 5.0 m from a point source is 117 dB. The power output of the source is: (Ans: 157 W)

Q6. The maximum pressure amplitude ΔPm that the human ear can tolerate is about 30 N/m^2. If the maximum displacement Sm is $1.3*10^{-5}$ m, find the frequency of the corresponding sound. ($\rho =1.2$ kg/m^3, the speed of sound $=340$ m/s). (Ans: 900 Hz)

Q7. Two identical speakers are connected in phase to the same source, as shown in Fig. 1. The speakers are 0.22 m apart and at ear level. An observer stands at distance of 1.2 m in front one speaker as shown in the figure. If the will hears maximum sound if the wavelength is: (Ans: 2.0 cm)

0.22 m

1.2 m

• P

Q8. A police car is moving at speed of 30 m/s. Its siren emits a sound at frequency of 600 Hz. As the car approaches a large wall, what is the frequency of the sound heard by the driver of the police car? (Ans: 716 Hz)

T042:
Q5: In a liquid having density 1.30×10^3 kg/m³, longitudinal waves with frequency of 400 Hz are found to have a wavelength of 8.0 m. Calculate the bulk modulus of the liquid. (Ans: 1.33×10^{10} Pa.)

Q6 :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]. **(**Ans: 277 Hz.)

Q7: 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 isotropic ally, find the power of the source. (Ans: 1.1×10^{-3} W)

Q8 :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? [Ans: 640 Hz.]

Q9: 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] [Ans: 2]
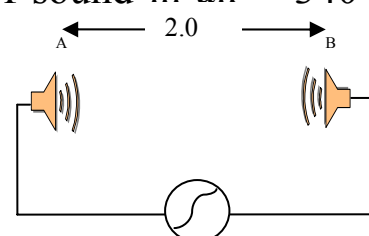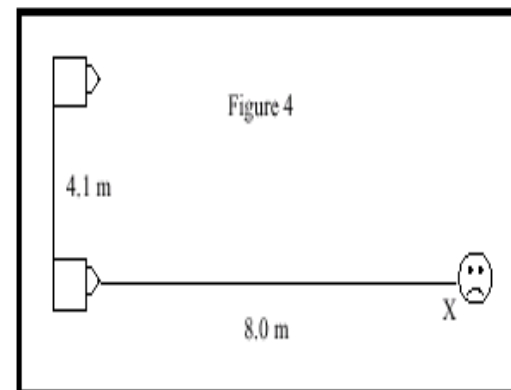
A — 2.0 → B

Figure 1

Q1: Two pipes have the same length L. Pipe B open at one end and closed at the other, while pipe A open both ends. Which harmonic of pipe B matches the second harmonic of pipe A? (Ans: Never match).

Q2: An ambulance emits sound with a frequency of 2600 Hz. After passing a motorist driving (in the same direction of the ambulance) with a speed of 5 m/s, the motorist receives the sound with frequency of 2424 Hz. Calculate the speed of the ambulance. [speed of sound in air is 340 m/s] (Ans: 30.0 m/s.)

Q3: The intensity of sound wave A is 800 times that of sound wave B at a fixed point from both sources. If the sound level of sound wave A is 110 dB. What is the sound level of wave B: (Ans: 81 dB.)

Q4: In figure 4, two small identical speakers are connected (in phase) to the same source. The speakers are 4.10 m apart and at ear level. An observer stands at X, 8.00 m in front of one speaker. In the frequency range 200 Hz-500 Hz, the sound he hears will be most intense if the frequency is: [speed of sound in air is 343 m/s] (Ans: 346 Hz)

Figure 4

4.1 m

8.0 m

X

T032:

Q6: 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)
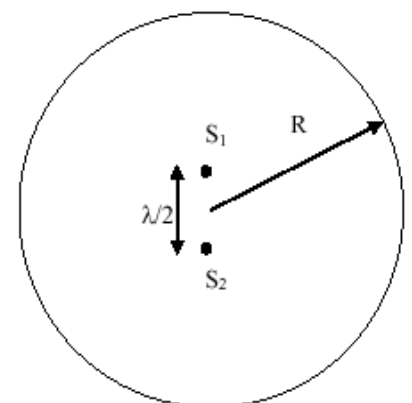
S_1

R

$\lambda/2$

S_2

Figure (1)

Q8: 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)

Q9: 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.)

Q10: 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.)