Department of Applied Physics
Applied Physics
Question Bank
Session – 2012-13
UNIT – II - Geometrical Optics and Acoustics

Multiple Choice Questions

1. Number of coordinal points in a coaxial lens system are

    (a) Two

    (b) Four

    (c) Six

    (d) Eight

2. Sound waves having frequency between 20 Hz to 20 kHz are known as

    (a) Infrasound

    (b) Audible sound

    (c) Ultrasound

    (d) Hyper sound

3. Which of the following statement is NOT true for ultrasonic waves

    (a) They have frequency more than 20kHz

    (b) They are mechanical vibrations

    (c) They are electromagnetic radiations

    (d) These waves are not sensed by human ear.

4. The upper limit of wavelength of ultrasonic waves is about

    (a) 2.5 cm

    (b) 2.5×10^3 cm

    (c) 2.5×10^{-6} cm

    (d) 2.5×10^{-8} cm

5. Sound waves with frequency more than 20 kHz are known as

    (a) Infrasound

(b) Audible sound

(c) Ultrasound

(d) None of these.

6. Which of the following is not a type of ultrasonic wave

    (a) Shear waves

    (b) Rayleigh waves

    (c) Lamb waves

    (d) Ultraviolet waves

7. Ultrasonic waves

    (a) Require a medium for their propagation

    (b) Have the frequencies in between 20 Hz to 20 kHz

    (c) Have only the longitudinal mode of propagation in solids

    (d) Can be produced by an organ pipe.

8. Ultrasonic drilling is based on the

    (a) High power of ultrasonics.

    (b) High frequency of ultrasonics.

    (c) Phenomenon of cavitation.

    (d) Acoustic pressure of ultrasonics.

9. In an ultrasonic generator which contains quartz plate, the frequency is relate to the density of plate by

    (a)

    (b) 1/

    (c) p

    (d)

10. If sound pressure is doubled, the increase in sound pressure level will be

    (a) 2 dB

    (b) 4 dB

    (c) 6 dB

    (d) 8 dB

11. Velocity of which kind of ultrasonic waves depends on the material thickness

    (a) Longitudinal ultrasonic waves

    (b) Shear waves

    (c) Rayleigh waves

    (d) Lamb waves.

12. Velocity of sound in air at a given temperature

    (a) Increases with increase in pressure

    (b) Decreases with increase in pressure

    (c) Is independent of pressure

    (d) Increases at low pressures and decreases at high pressures

Short Answer Questions
1. Define open window unit of absorption of sound.
2. What is magnetostriction effect?
3. What is reverberation and define reverberation time?
4. Discuss the cardinal points of an optical system.

Long Answer Questions
1. Discuss and determine the wavelength and velocity of ultrasonic sound using a water column.
2. Find the equivalent focal length of a combination of two thin lenses.
3. Show that the total energy absorbed by all wall surfaces in a hall is W= (*EvA*)/4 where *E* is the energy density *A* the absorption and *v* the velocity of sound.
4. What are the basic requirements of an acoustically good hall?
5. What are the factors affecting architectural acoustics and their remedy?
6. What are cardinal points of a coaxial lens system? State their properties and show their position in a diagram.

7. What are the different methods for the production of ultrasonic waves? Describe one of them in detail? How will you determine the wavelength of these waves.
8. What are cardinal points of a co-axial lens system? State their properties and show their positions in a diagram.
9. Describe magnetostriction method for the production of ultrasonic wave with figure.
10. A cinema hall has a volume of . it is required to have reverberation time of 1.5 sec. What should be the total absorption in the hall?
11. The volume of a room is . The wall area of the room is , the floor area is and the ceiling area is . The average sound absorption coefficient (i) for walls is 0.03, (ii) for the ceiling is 0.08 and (iii) for the floor is 0.06. Calculate the average sound absorption and the reverberation time.
12. What is piezo-electric effect? Calculate the natural frequency of ultrasonic waves using the following data:- Thickness of quartz plate . Young's modulus of quart ; density .

Numerical Problem

1. For an empty assembly hall of size the reverberation time is . Calculate the average absorption coefficient of the hall. What area of the wall should be covered by the curtain so as to reduce the reverberation time to given the absorption coefficient of curtain is
2. An ultrasonic source of sends down a pulse towards the seabed which returns after 0.65 sec. The velocity of sound in sea water is . Calculate the depth of sea and wave length of pulse.