

SARDAR PATEL UNIVERSITY
B.Sc. (I Semester) Examination
Wednesday, 13th April 2016
2.30 pm to 4.30 pm
PHYSICS

US01CPHY01 - Properties of Matter & Sound Waves

Que-1

Total Marks: 70

[10]

- Choose correct option to answer the question.
- (1) Within elastic limit the ratio of longitudinal stress to the linear strain is called _____.
 (a) Poisson's ratio (b) bulk modulus (c) modulus of rigidity
 (d) Young's modulus
 - (2) The unit of stress in M.K.S. is _____.
 (a) kg/m^3 (b) dyne/cm^2 (c) newton/m^2 (d) joule
 - (3) Twisting couple per unit twist is called _____.
 (a) Maxwell's rigidity (b) torsional rigidity (c) bending rigidity
 (d) flexural rigidity
 - (4) When a beam is bent the extension is _____ in the upper most filament.
 (a) maximum (b) minimum (c) extremum (d) zero
 - (5) Kundt's tube is used to measure _____ of sound waves.
 (a) temperature (b) density (c) pressure (d) velocity.
 - (6) Velocity of sound in a metal is given by $v =$ _____.
 (a) $\sqrt{\frac{K}{\rho}}$ (b) $\sqrt{K\rho}$ (c) $\sqrt{\frac{Y}{\rho}}$ (d) $\frac{Y}{\rho}$
 - (7) Velocity of sound at 0°C temperature is _____ m/s.
 (a) 280 (b) 332 (c) 300000 (d) 300
 - (8) Audible sounds have the frequencies _____.
 (a) between 20Hz to 20KHz (b) below 20 Hz (c) above 20 KHz
 (d) equal to 20 MHz.
 - (9) The relation between loudness and intensity of sound is defined as $L =$ _____.
 (a) $K \log(10 I)$ (b) $10 K \log I$ (c) $20 K \log I$ (d) $K \text{Log } I$
 - (10) If observer is in motion toward source and source of sound is steady then frequency of sound _____.
 (a) decreases (b) remains constant
 (c) increases (d) becomes zero

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(PTO)

Que-2 Answer briefly the following questions (Attempt Any Ten). [20]

- (1) Explain Hooke's law.
- (2) Define terms (i) stress and (ii) strain.
- (3) Define Poisson's ratio and give the theoretically limiting value of it.
- (4) What are advantages of Maxwell's vibrating needle method?
- (5) State the drawbacks of statistical method for the determination of modulus of rigidity.
- (6) Define axis of bending and bending moment.
- (7) Obtain relation between velocity, frequency, and wavelength of a wave.
- (8) At constant temperature discuss the effect of pressure on velocity of sound.
- (9) State applications of Kundt's tube.
- (10) Differentiate between musical sound and noise.
- (11) **State properties of ultrasonic waves.**
- (12) How does the ultrasonic waves useful to find depth of the sea?

Que-3 (a) Obtain an expression for modulus of rigidity η for a case of deforming cube of length L . [06]

(b) For the case of an elongation strain obtain $W = \frac{1}{2} \text{stress} \times \text{strain}$ for work done per unit volume. [04]

OR

Que-3 (a) Discuss experimental method for the Poisson's ratio of a rubber tube and derive the necessary expressions. [06]

(b) Obtain the relation connecting three elastic constants as [04]

$$\frac{9}{Y} = \frac{3}{\eta} + \frac{1}{K}$$

Que-4 (a) For a cylindrical wire derive the expression; [06]

$$C = \frac{\pi \eta r^4}{2l}$$

for twisting couple per unit twist.

(b) Obtain an expression for time period of torsional pendulum. How it is used to compare moment of inertia of two objects. [04]

OR

Que-4 (a) Explain the horizontal twisting apparatus method for the determination of modulus of rigidity of a rod. [06]

(b) For a beam which is supported at two ends and loaded at the middle derive an expression for depression. [04]

(2)

Que-5 Define longitudinal and transverse waves. Obtain expression for velocity of sound in a gaseous medium. [10]

OR

Que-5 Explain Kundt's tube experiment with necessary theory and show that how this tube is used for [10]

(1) Determination of sound velocity in metal

(2) Determination of sound velocity in liquid.

Que-6 (a) With necessary theory and circuit diagram explain piezo-electric method for the production of ultrasonic waves. [06]

(b) Discuss the following applications of Doppler effect [04]

(i) In estimating the speed of distant stars and planets

(ii) To estimate velocities of moving aero plane and submarine.

OR

Que-6 (a) What are ultrasonic waves? Explain magnetostriction method for the production of ultrasonic waves. [06]

(b) State any eight applications of ultrasonic waves [04]

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(3)