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SARDAR PATEL UNIVERSITY

B.Sc. (Sem.- I) EXAMINATION

Wednesday, 20th November 2013

02:30 p.m. to 04:30 p.m.

Subject: PHYSICS

Course: US01CPHY01

Title: Properties of Matter and Sound Waves

Total Marks: 70

- N.B:** (i) All the symbols have their usual meanings
(ii) Figures at the right side of questions indicate full marks

Q-1 Multiple Choice Questions (Attempt All)

(10)

- (1) The ratio of normal stress to volume strain is called _____
(a) Young's modulus (b) modulus of rigidity
(c) Bulk modulus (d) Poisson ratio
- (2) The reciprocal of bulk modulus is known as _____
(a) elasticity (b) compressibility
(c) plasticity (d) susceptibility
- (3) The SI unit of elastic constant is _____
(a) Kg/m^2 (b) gm/cm^2
(c) m/s^2 (d) N/m^2
- (4) The twisting couple per unit twist is also called _____
(a) torsional rigidity (b) modulus of rigidity
(c) coefficient of rigidity (d) constant of rigidity
- (5) The bending moment of a beam is directly proportional to _____ of the beam
(a) Bulk modulus (b) Young's modulus
(c) modulus of rigidity (d) radius of curvature
- (6) The twisting couple on a cylinder is inversely proportional to _____ of the cylinder
(a) radius (b) length
(c) mass (d) twisting angle
- (7) According to Newton's the propagation of sound wave in air is _____ phenomenon
(a) adiabatic (b) radiation
(c) isothermal (d) conduction
- (8) The velocity of sound in air is about _____ m/s
(a) 120 (b) 220
(c) 320 (d) 420
- (9) The intensity of sound wave is measured in terms of _____
(a) cal/m (b) watt/m
(c) cal/m^2 (d) watt/m^2
- (10) The relation between loudness and intensity of sound is
(a) $L = k \log I$ (b) $I = k \log L$
(c) $L = I_0 \log I$ (d) $L = I \log I_0$

Q-2 Short Questions (Attempt any Ten)

(20)

- (1) Define Young's modulus and modulus of rigidity
- (2) Explain stress-strain diagram
- (3) Find the limiting values of σ
- (4) Explain bending of beam
- (5) What are the draw backs of statical method?
- (6) What are the advantages of dynamical method?
- (7) Show that the speed of sound does not change with a change of pressure if the temperature of the gas remains constant
- (8) At what temperature will the speed of sound in air become double of its value at 0°C
- (9) Define longitudinal wave and find the relation between frequency, wavelength and velocity
- (10) State the characteristics of musical sound
- (11) Find the change in apparent frequency when source of sound in motion and observer is at rest
- (12) If the intensity is increased by a factor 20, by how many decibel is the sound level increased?

Q-3 (a) Derive the expression $K = \frac{1}{3(\alpha-2\beta)}$ for deformation of a cube **(6)**

(b) Find the expression for work done per unit volume in case of elongation strain for a wire **(4)**

OR

Q-3 (a) Derive the expression $\sigma = \frac{1}{2} \left[1 - \frac{1}{A} \frac{dV}{dL} \right]$ for rubber tube **(6)**

(b) Derive the relations for K and η in terms of σ **(4)**

Q-4 Describe the Maxwell's vibrating needle method and derive the expression $\eta = \frac{8\pi l a^2 (m_2 - m_1)}{r^4 (t_2^2 - t_1^2)}$ for a wire **(10)**

OR

Q-4 What is Cantilever? Find the expression of depression produced in the beam when the Cantilever loaded at free end and at the centre **(10)**

- Q-5** (a) Derive the expression of velocity of longitudinal wave in metal rod (6)
(b) Discuss the effect of temperature and humidity on the speed of sound (4)

OR

- Q-5** (a) Describe the construction and working of Kund's tube and derive the general expression for determination of the velocity of sound (6)
(b) Explain any two applications of Kund's tube (4)

- Q-6** (a) Describe the magnetostriction method for production of ultrasonic wave (6)
(b) Write any four applications of ultrasonic sound (4)

OR

- Q-6** (a) Describe the Piezo-electric method for production of ultrasonic wave (6)
(b) Write any four properties of ultrasonic sound (4)

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