

**LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034**

B.Sc. DEGREE EXAMINATION – PHYSICS

FIRST SEMESTER – APRIL 2010

**PH 1502/PH 1501 - PROPERTIES OF MATTER & ACOUSTICS**

Date & Time: 28/04/2010 / 9:00 - 12:00

Dept. No.

Max. : 100 Marks

**PART – A**

**Answer ALL Questions**

**(10x2=20 marks)**

1. What are the theoretical limits to the value of Poisson's ratio?
2. Calculate the work done in twisting a wire.
3. Define critical velocity.
4. State Newton's law of viscous flow.
5. What is surface energy & how is it related to surface tension?
6. Define surface tension and angle of contact.
7. Give the differential equation of a plane progressive wave which travels with a velocity 'v'.
8. What are beats?
9. What is Piezo-electric effect?
10. Name the principle used by the bats to navigate their flight.

**PART-B**

**Answer any FOUR Questions**

**(4x7.5=30 marks)**

11. Derive an expression for bending moment.
12. Discuss the working of McLeod gauge.
13. Describe Quincke's method of finding surface tension. Derive the formula employed.
14. Obtain an expression for velocity of transverse wave along a stretched string.
15. a) Describe magnetostriction method to produce ultrasonic waves.  
b) Write down the important applications of ultrasonic waves in industry and medicine.

**PART-C**

**Answer any FOUR Questions**

**(4x12.5=50 marks)**

16. a) Explain Koenig's method to determine the young's modulus of the material of a beam.  
b) A bar of 0.006 meter in radius is supported on two knife edges 1 m apart. A load of 1 Kg at the centre of the bar depresses that point by 2mm. Calculate the young's modulus of the material of the bar.

**(P.T.O.)**

17. a) Describe , with theory, Stoke's method of determining the viscosity of a highly viscous fluid.
- b) Castor oil at 20°C has a coefficient of viscosity  $2.42 \text{ Nsm}^{-2}$  and density  $940 \text{ kg m}^{-3}$  Calculate the terminal velocity of a steel ball of radius  $2 \times 10^{-3} \text{ m}$  falling under gravity in the oil. Density of steel ball is  $7800 \text{ kgm}^{-3}$
18. a) Obtain the expression for the excess of pressure inside (i) a spherical soap bubble and (ii) a spherical drop.
- b) Calculate the work done in spraying a spherical drop of water of  $10^{-3} \text{ m}$  radius in to million droplets, all of the same size. The surface tension of water is  $72 \times 10^{-3} \text{ Nm}^{-1}$ .
19. (a) Explain Doppler Effect.
- (b) Derive an expression for the change in frequency of a note when
- (i) Observer is at rest and source in motion
  - (ii) Observer is in motion and source is at rest
  - (iii) Observer and source in motion.
20. What is meant by reverberation? Define reverberation time. Derive Sabine's formula to determine reverberation time in an auditorium.

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