LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – **PHYSICS**

FIRST SEMESTER – **APRIL 2016**

PH 1503/1502/1501/1500 – PROPERTIES OF MATTER & ACOUSTICS

Date: 02-05-2016 Dept. No. Max. : 100 Marks

Time: 01:00-04:00

PART – A

Answer ALL questions: (10x2=20 marks)

1. Distinguish between a beam and a cantilever.
2. Differentiate between uniform and non-uniform bending.
3. Define coefficient of viscosity and give its unit.
4. State the working principle of a diffusion pump.
5. What is surface tension? Give its unit and dimension.
6. Calculate the height to which liquid will rise in a capillary tube of radius $0.2x10^{-3}$m. Density and surface tension of the liquid is given as 800 kgm^{-3} and 26 x 10^{-3} Nm^{-1}.
7. A source of sound has a frequency of 512 Hz and amplitude of 0.25 cm. Calculate the flow of energy. Given: Velocity of sound: 340 ms^{-1} and density of air: 1.3 kgm^{-3}.
8. What are beats?
9. Explain magnetostriction effect?
10. What is piezo-electric effect?

PART – B

Answer any FOUR questions: (4x7.5=30 marks)

11. a) Derive the general expression for the bending moment of a beam. (5+2.5)

    b) A steel wire of 1 mm radius is bent in the form of a circular arc of radius 50 cm. Calculate the bending moment. Given: E= 2 x 10^{11} Nm^{-2}

12. a) Derive Stoke's formula for the velocity of a small sphere falling through a viscous liquid using the method of dimensions. (5+2.5)

    b) A steel ball of radius $2x10^{-3}$m falls in a vertical column of castor oil of density 980 kgm^{-3}. The density of steel ball is 7700 kgm^{-3}. Calculate the product of coefficient viscosity and terminal velocity.

13. a) Discuss the construction and working of a rotary oil pump. (5+2.5)

    b) The receiver of an air pump has a capacity of 1.5 litres and the pressure of air is 76 cm of Hg. If the barrel has a capacity of 500 cc, find the pressure after 3 strokes.

14. a) Give an account of molecular theory of surface tension.

    b) Calculate the excess pressure inside a soap bubble of radius $3x10^{-3}$ m. Surface tension of soap solution is 20 x 10^{-3} Nm^{-1}. Also calculate the surface energy. (5+2.5)

15. Derive an expression for the velocity of a transverse wave in a stretched string.

16. a) Explain how the absorption coefficient of a material is determined. (5+2.5)

    b) A hall of volume 5500 m^3 is found to have a reverberation time of 2.3 sec. The sound absorbing surface of the hall has an area of 750 m^2. Calculate the absorption coefficient.

PART – C

Answer any FOUR questions: **(4x12.5=50 marks)**

17. a) Derive an expression for the period of oscillations of a torsional pendulum.

    b) Explain the experimental method to determine the rigidity modulus of a wire and moment of inertia of the disc about its axis by using torsional pendulum. (4.5+8)

18. a) Describe Koenig's method of determining the Young's modulus of the beam.

    b) A bar of length 1 m and cross section $5x10^{-3}$ m^2 is supported at its two ends and loaded in the middle. The depression observed in the middle is $1.96x10^{-3}$m, when a load of 0.1 kg is placed. Calculate the Young's modulus of the material. (8.5+4)

19. a) Derive Poiseuille's formula for the rate of flow of liquid through a capillary tube.
    b) Discuss the effect of temperature and pressure on viscosity. (8.5+4)

20. a) Describe the Jaeger's method for the determination of surface tension of a liquid.
    b) Discuss the advantages and disadvantages of the method. (6.5+6)

21. a) Explain Doppler effect.
    b) Find an expression for the change in frequency when both the source of sound and the observer are in relative motion. (2.5+10)

22. a) Describe the method of producing ultrasonic waves using magnetostriction method.
    b) Discuss any six applications of ultrasonic waves. (6.5+6)

* * * * * * *