LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

FIRST SEMESTER – NOVEMBER 2011

PH 1502/PH 1501 - PROPERTIES OF MATTER & ACOUSTICS

Date : 08-11-2011   Dept. No.   Max. : 100 Marks
Time : 1:00 - 4:00

PART-A

ANSWER ALL QUESTIONS: (10x2=20)

1. Show that the theoretical limiting values of Poisson's ratio are -1 and 1/2.
2. Distinguish between uniform and non- uniform bending.
3. Write the unit and the dimensional formula for the coefficient of viscosity.
4. What is critical velocity?
5. Define surface tension of a liquid. Give its dimensional formula.
6. What is capillarity? Give one example.
7. The equation of a progressive wave is given by $Y = 15 \sin 2\pi(400t - 0.01x)$, calculate the amplitude and period.
8. What is an echo? What should be the distance between the source and the obstacle to produce echo?
9. Name two materials that can absorb sound waves.
10. Give two applications of ultrasonics in industries.

PART – B

ANSWER ANY FOUR QUESTIONS   (4x7.5=30)

11. What torque must be applied to a wire one meter long, 10^{-3}m in diameter in order to twist the free end of it through 90°, the other end remaining fixed?
    Given $G = 2.8 \times 10^{10}$ N m^{-2}
12. Explain the principle and working of Knudsen gauge.
13. Explain how surface tension is accounted for on kinetic theory.
14. Obtain an expression for the velocity of transverse waves in a string. Calculate the fundamental frequency.
15. Describe Piezo-electric method to produce ultra sonic waves.

PART – C

ANSWER ANY FOUR QUESTIONS   (4x12.5=50)

16. Obtain an expression to find the internal bending moment of a beam. Use it to calculate the depression of the loaded end of a cantilever and determine the young's modulus of a given beam by non-uniform bending experiment.

17. a) Derive Poiseuille's formula for the rate flow of liquid through capillary tube.

b) Calculate the coefficient of viscosity of water from the following data obtained in the capillary flow method:

Length of the tube : l: 0.363 m

Radius of the capillary bore : a: 0.64×10^{-3} m

Height of the liquid column above the tube : h : 0.4m

Rate flow of water : v : 0.57×10^{-6} m^3/s

18. a) Show that the excess of pressure across a curved liquid surface is
$T \{ 1/R_1 + 1/R_2 \}$

b) The pressure of air in a soap bubble of 7×10^{-3}m diameter is 8×10^{-3} m of water above the atmospheric pressure. Calculate the surface tension of the soap solution.

19. Explain Doppler's effect. Derive an expression for the change in frequency of a note when

(i) observer is at rest and source in motion

(ii) observer is motion and source is at rest

(iii) observer and source in motion and

(iv) discuss the effect of wind.

20. What is meant by reverberation? Derive Sabine's formula for reverberation time and hence determine the absorption coefficient.

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