

LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034**B.Sc. DEGREE EXAMINATION – PHYSICS****FIRST SEMESTER – NOVEMBER 2023****UPH 1501 – PROPERTIES OF MATTER AND ACOUSTICS**

Date: 01-11-2023

Dept. No.

Max. : 100 Marks

Time: 09:00 AM - 12:00 NOON

SECTION A - K1 (CO1)**Answer ALL the Questions****(10 x 1 = 10)****1. Answer the following**

- a) Strain
 b) Terminal velocity
 c) Angle of contact
 d) Wave velocity
 e) Loudness of sound

2. Fill in the blanks

- a) _____ law states that stress is directly proportional to strain within the elastic limit.
 b) The unit of coefficient of viscosity is _____
 c) "The hair of a shaving brush clings together when taken out of water". This is an example for ____
 d) The maximum displacement of a vibrating particle is called its _____
 e) SONAR is the abbreviation of _____

SECTION A - K2 (CO1)**Answer ALL the Questions
10)****(10 x 1 =****3. True or False**

- a) Poisson's ratio is defined as the ratio of lateral strain to longitudinal strain.
 b) The viscosity of the liquids decreases with temperature.
 c) Cohesive forces are the forces of attraction acting between molecules of the same substance.
 d) The time period of SHM is $T = 2\pi\omega$
 e) The frequency of ultrasonic wave is 20 Hz to 20000 Hz.

4. Match the following

- a) Bulk Stress - 10 dB
 b) Ostwald Viscometer - N/m^2
 c) Surface tension - Viscosity
 d) Frequency - N/m
 e) 1 Bel - Hertz

SECTION B - K3 (CO2)**Answer any TWO of the following****(2 x 10 = 20)**

5. a. Illustrate the stress - strain diagram (3 Marks)
 b. Construct a cantilever by fixing one end and loading the other and obtain the expression for the depression produced at the loaded end of the cantilever. (7 marks)
6. Construct the Poiseuille's set up, to determine the coefficient of viscosity of the given liquid.
7. Describe the appropriate experimental technique to determine the interfacial surface tension between water and liquid.
8. a. Represent the SHM by a wave. (3 marks)

b. Develop the differential equation of SHM. (7 marks)

SECTION C – K4 (CO3)

Answer any TWO of the following

(2 x 10 = 20)

9. Classify the three moduli of elasticity and deduce the relations between them.

10. a. Distinguish between streamline and turbulent motion. (4 marks)
b. Examine the Rankine's method to determine the viscosity of gas. (6 marks)

11. Explain the Jaegar's method to determine the surface tension of a liquid at different temperatures

12. List out the various factors affecting the acoustics of building and explain the same.

SECTION D – K5 (CO4)

Answer any ONE of the following

(1 x 20 = 20)

13. a. Differentiate uniform and non-uniform bending. (5 marks)
b. Explain in detail about the Koenig's method to determine the Young's modulus of the given material with a neat sketch. (15 marks)

14. a. State and prove Bernoulli's theorem (10 marks)
b. Assess the use of Bernoulli's theorem in Venturimeter. (10 marks)

SECTION E – K6 (CO5)

Answer any ONE of the following

(1 x 20 = 20)

15. a. Formulate an expression for the excess of pressure inside a curved liquid surface and analyse the same for spherical and cylindrical drop. (15 marks)
b. 50 drops of water falling down a tube of external radius 1.75 mm are collected under oil of specific gravity 0.8. Determine the interfacial surface tension between water and oil if the water collected weighs 6.175 grams. (5 marks)

16. a. Construct an experimental setup to produce the ultrasonic waves using piezoelectric crystal and compile its merits and demerits. (15 marks)
b. A quartz crystal of thickness 0.001 m is vibrating at resonance. Calculate the fundamental frequency. Given: Young's modulus and the density of the quartz crystal is $7.9 \times 10^{10} \text{ Nm}^{-2}$ and 2650 kg m^{-3} respectively. (5 marks)

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