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Reg. No. : _____

Code No. : 20599 E Sub. Code : EMPH 11

B.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2025.

First Semester

Physics – Core

PROPERTIES OF MATTER AND ACOUSTICS

(For those who joined in July 2023 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. If a wire is stretched to double of its original length, then the strain in the wire is
- (a) 1
(b) 2
(c) 3
(d) 4

2. Which of the following is not a scalar?
- (a) Viscosity (b) Surface tension
(c) Pressure (d) Stress
3. Considering depression (S) at the loaded end of a cantilever, the depression at half the length of the cantilever is
- (a) S (b) $S/8$
(c) $S/2$ (d) $S/4$
4. In non-uniform bending the depression (δ) is related to thickness (d) of the beam by
- (a) $\delta \propto d$ (b) $\delta \propto \frac{1}{d}$
(c) $\delta \propto \frac{1}{d^2}$ (d) $\delta \propto \frac{1}{d^3}$
5. The unit for surface tension is _____
- (a) Nm^{-2} (b) Nm^{-1}
(c) Nm^3 (d) N^2m
6. Stokes formula $F =$ _____
- (a) $6\pi\eta aV$ (b) $6\pi\eta/aV$
(c) $\pi\eta/6aV$ (d) $\pi\eta/V$

7. In simple harmonic motion, the acceleration (a) = _____

- (a) $w^2 y$ (b) $-w^2 y$
(c) $-w^2 / y$ (d) w^2 / y

8. The frequency is related to time period by _____

- (a) $f = \frac{1}{T}$ (b) $f = T$
(c) $f = \sqrt{T}$ (d) $f = \frac{1}{\sqrt{T}}$

9. The reverberation time is _____ to absorption coefficients

- (a) directly proportional
(b) inversely proportional
(c) equal
(d) none

10. The frequency range of audible sound waves _____

- (a) below 20 Hz (b) above 2000 Hz
(c) 20 Hz to 2000 Hz (d) 20 Hz to 200 Hz

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).
Each answer should not exceed 250 words.

11. (a) Describe the three elastic moduli.

Or

(b) A wire of length $2m$ with the area of cross-section $10^{-6} m^2$ is used to suspend a load of $980N$. Calculate the stress and strain developed in the wire. ($Y = 12 \times 10^{10} N/m^2$)

12. (a) Derive the expression for the bending moment of beam.

Or

(b) Derive the expression for time period of the cantilever.

13. (a) Obtain an expression for the excess of pressure inside a (i) liquid drop (ii) liquid bubble (ii) air bubble.

Or

(b) Explain the variation of viscosity of a liquid with temperature.

14. (a) Explain in detail of forced vibrations.
Or
(b) Write a note on resonance and sharpness of resonance.
15. (a) Define intensity of sound and loudness of sound.
Or
(b) Describe the applications of ultrasonic waves.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).
Each answer should not exceed 600 words.

16. (a) Derive the relation between three elastic moduli.
Or
(b) Explain the determination of rigidity modulus using torsion pendulum. (without masses)
17. (a) Describe the pin and microscope experimental for the determination of young's modulus of a beam by uniform bending method.
Or
(b) Derive the expression for the depression of a cantilever.

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18. (a) Explain the Jaeger's method of studying the effect of temperature of surface tension.

Or

- (b) Derive the expression for the terminal velocity of a sphere moving in a high viscous fluid using stokes force.
19. (a) Explain the laws of transverse vibrations of strings.

Or

- (b) Explain Melde's string method of determining the frequency of a tuning fork by longitudinal.
20. (a) Explain the production of ultrasonic waves by Piezo – electric method.
Or
(b) Explain the production of ultrasonic waves by magnetostriction method.

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