(6 pages) **Reg. No. :** .....

Code No. : 20294 E **Sub. Code : CMPH 11**

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

First Semester

Physics — Core

PROPERTIES OF MATTER AND MECHANICS

(For those who joined in July 2021 and 2022 only)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. Hooke's law is

   (a) stress = strain (b) stress α strain

   (c) stress / strain (d) $\frac{1}{2}$ × stress × strain

2. Maximum value of Poisson's ratio

   (a) 0.1 (b) 0.5

   (c) 0.4 (d) 0.2

3. The young's modulus of the material of the beam is calculated using the formula E

   (a) $\frac{3Mgal^2}{2bd^3y}$ (b) $\frac{3Mgl^2}{2bd^3s}$

   (c) $\frac{3Mgl^2}{12bd^3}$ (d) $\frac{3Mgl}{12b^3s}$

4. In cantilever beams, there is _____ stress above neutral axis.

   (a) compressive (b) tensile

   (c) temperature (d) shear

5. Surface tension is due to

   (a) Cohesive molecular forces

   (b) Gravitational forces

   (c) Nuclear forces

   (d) Electrical forces

6. Dimensional formula for viscosity is

   (a) $M^1L^1T^{-2}$ (b) $M^1L^{-1}T^{-2}$

   (c) $M^1L^{-1}T^{-1}$ (d) $M^1L^{-2}T^{-1}$

7. Impulse is also known as

(a) mv (b) mu – mv

(c) mv – mu (d) mu + mv

8. According to Newton's II law

(a) F = ma

(b) a = mF

(c) m = Fa

(d) $F = \frac{m}{a}$

9. The pressure for an ideal gas can be given by

(a) PV = nRT (b) P = RT

(c) PV = T (d) P = VT

10. Bernoulli's principle is derived from

(a) Conservation of energy

(b) Conservation of mass

(c) Newton's law of motion

(d) Conservation of momentum

PART B — (5 × 5 = 25 marks)

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

11. (a) State and explain Hooke's law.

Or

(b) Derive an expression for the period of oscillation of a torsion pendulum.

12. (a) Explain the terms neutral axis and bending moment of a beam.

Or

(b) Derive an expression for the period of oscillation of a cantilever.

13. (a) Obtain an expression for the excess of pressure inside a spherical soap bubble.

Or

(b) Explain how does the viscosity of a liquid vary with temperature.

14. (a) Define terms : (i) Angular momentum (ii) Moment of Inertia and Radius of Gyration.

Or

(b) State and explain Newton's second law for rotation.

15. (a) Define (i) Metacentre (ii) Meta centric height.

Or

(b) Describe the centre of pressure on a rectangular lamina.

PART C — (5 × 8 = 40 marks)

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

16. (a) Explain the relation between angle of shear and linear strain.

Or

(b) Describe with theory determine the rigidity modulus of a wire by torsion pendulum.

17. (a) What is a cantilever? Derive an expression for its period of oscillation and determine the young's modulus.

Or

(b) (i) State differences between uniform and non uniform bending.

(ii) State the basic assumptions for theory of bending of beams.

18. (a) Describe Quincke's method of finding surface tension.

Or

(b) Define coefficient of viscosity. How does the coefficient of viscosity change with temperature?

19. (a) State and explain parallel axes and perpendicular axes theorem.

Or

(b) Explain acceleration of a body rolling down an inclined plane.

20. (a) Explain steady and stream line flow.

Or

(b) State and prove Bernoulli's theorem.

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