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SUBJECT CODE NO: -BB-2305**FACULTY OF SCIENCE AND TECHNOLOGY****B.Sc. (CBCGS)(Pattern -2022) F.Y SEM I****Examination November / December 2025****Physics Paper-I Mechanics & Properties of Matter****[Time: 1:30Hours]****[Max. Marks:40]**

Please check whether you have got the right question paper.

N. B

- 1) Attempt all Questions.
- 2) Use of logarithmic table & electronic pocket calculator is allowed.

Q1 (a) Define compound pendulum and derive an expression for its time period. 10**OR**

- (b) Derive an expression for periodic time of a torsional pendulum. 5
- (c) What couple must be applied to a wire 1 meter long and 1 mm in diameter in order to twist one end of it through 90° , the other end remaining fixed. The rigidity of the material of the wire is 2.8×10^{11} dynes/cm². 5

Q2 Explain practical applications of Bernoulli's theorem as: 10

- (i) Law of hydrostatic pressure
- (ii) Filter pump

OR

- (a) Define surface tension. Explain Jaeger's method for determining the surface tension of a liquid. 5
- (b) Calculate the depth of water at which an air bubble of radius 4×10^{-4} m may remain in equilibrium. Surface tension of water $= 7 \times 10^{-3}$ N/m. 5

Q3 Solve any two from following:

1. Two lead spheres of 20 cm and 2 cm diameter respectively are placed with their centers 100cm apart. Calculate the force of attraction between the spheres. Given the radius of the earth as 6.67×10^8 cm and its mean density as 5.33gm/cc (SP. Gr. of lead is 11.5). 5
2. Deduce an expression for the bending moment for a thin uniform beam of circular cross-section area. 5
3. Water flows through a horizontal capillary tube of 1 mm internal diameter and 70 cm length under pressure of a column of water 30 cm in height. Find the rate of water through the capillary tube. 5
4. Show that Excess of pressure inside a soap bubble is $4T/r$. 5

Q4 Multiple Choice Questions 10

1. The nature of gravitational field is _____
- (a) Conservative (b) Non-conservative (c) Pseud (d) Solenoidal

2. When the beam is loaded at one end, the change in length of any longitudinal filament is proportional to its distance from
 (a) Natural surface (b) Upper surface
 (c) Lower surface (d) None of these
3. Consider A and B are two wires. The radius of A is twice that of B. If they are stretched by the same load, then the stress on B is
 (a) Equal to that of A (b) Two Times that of A
 (c) Four times that of A (d) Half times that of A
4. The bulk modulus of metal is $8 \times 10^9 \text{ N/m}^2$. The pressure required to reduce the volume of a spherical ball of that metal by 5% is
 (a) $2 \times 10^8 \text{ N/m}^2$ (b) $4 \times 10^8 \text{ N/m}^2$
 (c) $6 \times 10^8 \text{ N/m}^2$ (d) $5 \times 10^8 \text{ N/m}^2$
5. Viscosity in fluids refers to
 (a) The Density of a fluid
 (b) Tangential force exerted on a solid surface by flowing liquid
 (c) Compressibility of fluid
 (d) None of these
6. volume of liquid that flows per unit through any cross-section is called
 (a) Surface tension (b) reverberation
 (c) Viscosity (d) Ultrasonic flow
7. The force per unit length acting normally along a line tangent to its free surface liquid is called
 (a) Viscosity (b) Solubility (c) Surface tension (d) None of these
8. Raindrops are spherical in shape because of:
 (a) Capillary action (b) Surface tension
 (c) Downward (d) Acceleration due to gravity
9. The distance between the center of suspension and the center of oscillation is equal to
 (a) The Radius of gyration
 (b) The Length of compound pendulum
 (c) The Length of equivalent simple pendulum corresponding to a compound pendulum
 (d) None of above
10. The formula to determine time period of compound pendulum executing angular SHM is
 (a) $T = 2\pi \sqrt{\frac{I}{mgl^2}}$ (b) $t = 2\pi \sqrt{\frac{l^2}{mgl}}$
 (c) $T = 2\pi \sqrt{\frac{I}{mgl}}$ (d) $T = 2\pi \sqrt{\frac{1}{mgl}}$

