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Subsidiary for B.Sc. Honours / I   A
PHYSICS – Paper I
Properties of Matter

Time : 3 Hours   **Maximum Marks : 50**

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt any **five** questions.
Attempt parts of a question together.
All questions carry equal marks.

1.   (a)   What are the uses of dimensional analysis ?   **4**

      (b)   Establish dimensionally the connection between the time of oscillation t of a drop of liquid of radius r, surface tension T and density d.   **3**

      (c)   Express a force of 100 dynes in terms of the MKS system of units.   **3.**

2.   (a)   Define moment of inertia of a body about an axis. State and prove the theorem of parallel axes for a plane laminar body.   **7**

      (b)   Calculate the moment of inertia of a cylindrical body of mass 500 gms, length 20 cm and radius of cross-section 1.2 cm, about an axis perpendicular to its length and passing through its centre.   **3**

3. Define the terms gravitational potential and gravitational field. Derive expressions for the gravitational potential at a point

(i) Outside and

(ii) inside, a solid sphere. **10**

4. Describe Kater's reversible pendulum and derive the expression for the acceleration due to gravity in terms of the nearly equal periods of oscillation about the two parallel knife edges. **10**

5. (a) What do you understand by 'bending moment' ? Derive an expression for the couple required to bend a uniform beam into an arc of a circle of small curvature. **5**

(b) A uniform beam is clamped horizontally at one end and loaded at the other. Obtain the relation between the load and the depression at the loaded end. **5**

6. (a) Define coefficient of viscosity of a liquid and derive Poiseulli's formula for the rate of flow of a liquid through a capillary tube. **6**

(b) State Bernoulli's theorem. Explain how a venturimeter can be used to determine the rate of flow of water in a pipe. **4**

7. (a) Describe, with necessary theory, Jaeger's method for determination of surface tension of a liquid. 7

(b) Calculate the amount of work done in blowing a soap bubble from a radius of 10 cm to 15 cm. Surface tension of soap solution = 35 dynes/cm. 3

8. Write short notes on any **two** of the following :

(a) Boy's method for determination of G.

(b) Variation of g with latitude.

(c) Work done in deforming a body.

(d) Mcleod gauge. **5, 5**