K26FY1249 Pages: 2 Reg No:.....
Name:.....

Second Semester FYUGP Degree (Reg/Sup/Imp) Examination April 2026

KU2DSCPHY102 - PHYSICS OF SOLIDS AND FLUIDS

2024 Admission onwards

Time : 1.5 hours Maximum Marks : 50

Section A

Answer any 6 questions. Each carry 2 marks.

1. Define moment of inertia of a rigid body. Give its S.I unit.
2. What is the analogue of mass in rotational motion? Give its SI unit.
3. The velocities of three molecules of a gas are 3v, 4v and 5v. Determine the root mean square velocity.
4. Define a mean free path. How is it related to the pressure and temperature of the gas?
5. What are pressure gauges? Give any two examples.
6. Distinguish between steady flow and turbulent flow.
7. Define Young's Modulus and Rigidity Modulus.
8. Give an expression for the frequency of a torsional pendulum and explain each term.

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Section B

Answer any 4 questions. Each carry 6 marks.

9. A 15 kg solid gold statue is raised from the sea bottom. Calculate the tension in the hoisting cable (assumed massless) when the statue is at rest and completely underwater. Given: Density of gold = 19.3 x 10^3 kg/m3, density of sea water = 1.03 x 10^3 kg/m^3.
10. In a car lift, compressed air exerts a force F_1 on a small circular piston having a radius 5 cm. This pressure is transmitted to a second piston of radius 15 cm. If the mass of the car to be lifted is 1350 kg, what is F_1? What is the pressure necessary to do this task?
11. Water is flowing through two horizontal pipes of different diameters which are connected together. In the first pipe, the speed of water is 4 m/s. Calculate the speed of water in the second pipe. The diameters of the pipes are 3 cm and 6 cm respectively.

12. Explain the behavior of a wire under increasing load.

13. Derive an expression for the time period of a torsion pendulum.

14. A steel wire of 2 mm diameter is bent to form a circle of 20 cm diameter. What is the bending moment and the maximum stress, if the Young's modulus of steel = 2×1011 Nm-2?

Section C

Answer any 1 questions. Each carry 14 marks.

15. (a) Derive an expression for the moment of inertia of a thin uniform rod about an axis through its centre and perpendicular to its length. Also determine the radius of gyration about the same axis.

    (b) Derive an expression for the moment of inertia of a solid cylinder about its own axis.

16. (a) Explain how the Young's modulus of the material of a bar supported uniformly and loaded uniformly at the ends is experimentally determined.

    (b) State the postulates of kinetic theory of gases. Derive an expression for the pressure exerted by an ideal gas.

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