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Reg. No. : .....

Name : .....

First Semester B.Sc. Degree Examination, March 2023

First Degree Programme under CBCSS

Physics

Complementary Course for Chemistry

PY 1131.2 — ROTATIONAL DYNAMICS AND PROPERTIES OF MATTER

(2018 Admission Onwards)

Time : 3 Hours Max. Marks : 80

SECTION – A

Answer **all** questions. Each question carries **1** mark.

1. Write the unit and dimension of moment of inertia.
2. Give example of a rigid bodies having equal values of principal moments of inertia.
3. What is the moment of inertia of a rectangular lamina?
4. Write the equation of motion of a torsion pendulum.
5. What are the types of wave motion?
6. Give one dimensional wave equation.
7. What is the unit of coefficient of viscosity?
8. What happens to viscosity, if temperature is increased?
9. What is the rate of flow of a liquid through a capillary tube?
10. What is the dimension of Young's modulus?

(10 × 1 = 10 Marks)

P.T.O.

SECTION – B

Answer any **eight** questions. Each question carries **2** marks.

11. Discuss the types of motion of a rigid body.
12. State perpendicular axis theorem.
13. Define amplitude of a wave.
14. Discuss the characteristics of wave motion.
15. What are spherical waves?
16. Oil spreads over surface of water whereas water does not spread over surface of oil. Explain.
17. What are the factors that depend on the flow of a liquid through a capillary tube?
18. What are the limitations of Poiseuille's formula?
19. Differentiate cohesive and adhesive force.
20. What is angle of twist?
21. Differentiate uniform and non-uniform bending
22. Explain torsional rigidity.

(8 × 2 = 16 Marks)

SECTION – C

Answer any **six** questions, not exceeding a paragraph. Each carries **4** marks.

23. A thin uniform disc of radius 25 cm and mass 1 kg has a hole of radius 5 cm at a distance of 10 cm from the center of the disc. Calculate the moment of inertia of the disc about an axis perpendicular to the plane and passing through the center of the hole.

24. A solid cylinder of radius 6.0 cm is suspended by a vertical wire as a torsion pendulum. The axis of the cylinder is along the wire. Find the moment of torsion, t, of the wire if the mass of the cylinder be 5.0 kg and period of vibration 4.0 s.

25. A thin circular ring is suspended from a peg so that it can oscillate about it. Determine its period of oscillation if its radius is 10 cm.

26. Surface tension of a soap solution is 0.05 N/m. How much work is done to produce the soap bubble of radius 0.03 m?

27. Two solid cylinders of solid material having length *l* and *2 l* and radii r and 2r are joined coaxially. Under a couple applied between free ends, the shorter cylinder show twist 30°. Calculate the twist of the longer cylinder.

28. Discuss the theory of surface tension.

29. Explain the theory and principle to determine the moment of inertia of a fly wheel.

30. Calculate the Young's modulus of a wire 100 cm long and 3 mm thick, which increases by 0.1 cm when stretched by a weight of 64.1 kg?

31. Using parallel axis theorem, calculate moment of inertia of a disc of mass 200 g and radius 5 cm about an axis passing through its edge and perpendicular to plane of the disc.

(6 × 4 = 24 Marks)

SECTION – D

Answer any **two** questions. Each question carries **15** marks.

32. (a) Discuss Parallel and perpendicular axis theorems.

    (b) Calculate the moment of inertia of an annular disc of mass M and radius R about

        (i) its own axis,

        (ii) about tangential axis parallel to its own axis,

        (iii) about its diameter, and

        (iv) about a tangential axis parallel to its diameter.

33. What are plane progressive harmonic waves? What are its characteristics? Obtain the equation of energy density of a plane progressive wave. What is its significance?