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Reg. No. : .....

Name : .....

ALL SAINTS COLLEGE LIBRARY NO. TRIVANDRUM

First Semester B.Sc., Degree Examination, June 2022

First Degree Programme Under CBCSS

PHYSICS

Complementary Course for Mathematics

PY 1131.1 : MECHANICS AND PROPERTIES OF MATTER

(2018 & 2019 Admission)

Time : 3 Hours Max. Marks : 80

SECTION – A

(Answer **all** questions in **one** or **two** sentences; each question carries **1** mark).

1. Why moment of inertia is called rotational inertia?
2. How does moment of inertia affect speed?
3. State perpendicular axis theorem?
4. Explain the term amplitude, frequency and period of time?
5. What is torsional pendulum?
6. Define surface tension.
7. Explain why small drops of liquid are spherical in shape?
8. What is the principle of viscometer?

P.T.O.

9. Why two streamlines cannot cross each other?

10. Why the pressure of water decreases when it flows from a broader pipe to a narrower pipe?

(10 × 1 = 10 Marks)

SECTION – B

(Answer **any eight** questions, not exceeding a paragraph; each question carries **2** marks).

11. What is the physical significance of moment of inertia?

12. Derive an expression for moment of inertia of an annular ring?

13. Derive an expression for the kinetic energy of a rotating body with uniform angular velocity?

14. Draw a graph showing the variation of time period of a compound pendulum with distance of point suspension from one end.

15. What is meant by free oscillation?

16. What are the characteristics of progressive wave?

17. Explain the term angle of shear and angle of twist.

18. Deduce an equation for plane progressive wave.

19. What is cantilever? Write an expressions for depression of cantilever when the load is fixed at the centre.

20. How do the insects run on the surface of water?

21. Obtain an expression for twisting couple per unit twist of a wire?

22. Explain the working of an Ostwald's viscometer?

(8 × 2 = 16 Marks)

SECTION – C

(Answer **any six,** each question carries **4** marks).

23. Calculate the moment of inertia of a uniform circular disc of mass 500gm and radius 10 cm about its diameter?

24. What is the angular momentum of a particle whose rotational kinetic energy is 18 joules, if the angular momentum vector coincides with the axis of rotation and its moment of inertia about the axis is 0.01 kgm^2?

25. A particle of mass 10gm lies in a potential field V=50x2+100 ergs/gm. Deduce the frequency of oscillation?

26. Find the frequency, period and wave number for a light of wavelength 6000 AU.

27. The total energy of a particle executing a simple harmonic motion of period 2π second is 10.24×10^4 joule. The displacement of the particle at $\pi/4$ second is $8\sqrt{2}$ cm. Calculate the amplitude of the motion?

28. Calculate the twisting couple on a solid shaft of length 1.5 m and diameter 120mm when it is twisted through an angle 0.6°. The coefficient of rigidity for the material of the shaft may be taken to be 93×10^9 N/m2.

29. A brass bar 1 cm square in cross section is supported on two knife edge 100 cm apart. A load of 1 kg at the centre of the bar depresses that point by 2.51 mm. What is Young's modulus for brass?

30. A liquid is flowing through a 25 cm long tube of 1mm internal diameter due to a pressure of 10 cm of mercury. Calculate the volume of the liquid flowing out in one minute?

31. By how much will the surface of liquid be depressed in a glass tube of radius 0.02 cm, if the angle of contact of the liquid is 135° and its surface tension is 54.7×10^{-2} nm^{-1}? Density of 1iquid =13500 kgm^{-3}.

(6 × 4 = 24 Marks)

SECTION – D

(Answer **any two** questions, each question carries **15** marks.)

32. Briefly explain the theory and experimental setup for the measurement of moment of inertia of a flywheel.

33. With necessary theory obtain an expression for the period of oscillation of a compound pendulum.

34. What do mean by bending moment? Derive an expression for the depression of a uniform beam supported at its ends and loaded in the middle.

35. Derive Poiseulli's formulae.

(2 × 15 = 30 Marks)
