S – 2707

Reg. No. : ....

Name : ....

First Semester B.Sc. Degree Examination, January 2024

First Degree Programme under CBCSS

Physics

Complementary Course for Chemistry

PY 1131.2 : ROTATIONAL DYNAMICS AND PROPERTIES OF MATTER

(2023 Admission)

Time : 3 Hours

Max. Marks : 80

SECTION – A

Answer **all** the questions in **one** or **two** sentences. Each question carries **1** mark.

1. Define parallel axis theorem.

2. What form of energy does flywheel store?

3. Give the perpendicular axes theorem for a plane lamina.

4. Define compound pendulum.

5. Write the characteristics of SHM.

6. Give the difference between periodic and oscillatory motions.

7. Explain progressive wave.

8. Define surface energy.

9. What are the factors affecting surface tension?

10. Define streamline flow.

(10 × 1 = 10 Marks)

P.T.O.

Answer any **eight** questions, not exceeding a paragraph. Each question carries 2 marks.

11. Define simple harmonic motion. Give any two examples of simple harmonic motion.

12. Determine the moment of inertia of a thin ring about an axis passing through its diameter.

13. Write down the differential equation for a simple harmonic oscillator. Explain the different terms.

14. Give the expression for (a) velocity of a particle executing linear SHM (b) acceleration of a particle executing linear SHM.

15. Describe any two characteristics of progressive waves.

16. Does mass affect oscillation spring? Explain.

17. Explain bending moment.

18. What are torsional oscillations?

19. Bring out the expression for excess of pressure inside a spherical liquid drop and a spherical bubble.

20. Which rain drops fall faster, big ones or small ones? Why?

21. Give any two applications of surface tension.

22. Hot water is preferred to cold water for washing clothes. Why?

(8 × 2 = 16 Marks)

SECTION - C

Answer any **six** questions. Each question carries **4** marks.

23. Starting from rest, the flywheel of a motor attains an angular velocity 100 rad/s from rest in 10 s. Calculate (a) angular acceleration and (b) angular displacement in 10 second.

24. The equation of a progressive harmonic wave is $y = 8 \sin \pi \left(\dfrac{t}{0.05} - x \right)$ cm.

Find the amplitude, frequency, velocity and wavelength.

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25. A body is thrown vertically up from the ground with a velocity of 39.2 ms^{-1}. At what height will its kinetic energy be reduced to one–fourth of its original kinetic energy?

26. The equation of a particle executing SHM is $y = 5(\sin \pi t + \pi / 3)$. Calculate (a) amplitude (b) period (c) maximum velocity and (d) velocity after 1 second (is in metre).

27. A torsional pendulum is made by suspending a metal disc having mass 1.5 kg, radius 0.1 m at the end of a wire of length 12.5 cm and radius 0.6 mm. If the period of torsional oscillations is 2 second, find the rigidity modulus of the given wire.

28. Calculate the depression at the free end of the light cantilever loaded by 1.8 kg at the free end if it has a length of 1.2 m, breadth 3 cm and thickness 9mm. Young's modulus of the material is 1.9×10^{11} Nm^{-2}.

29. A sphere contracts in volume by 0.01% when taken to the bottom of sea 1 km deep. If the density of sea water is 103 kg m^{-3}, find the bulk modulus of the material of the sphere.

30. A circular Wire loop of 0.03 m radius is rested on the surface of a liquid and then raised. The pull required is 0.003 kg wt greater than the force acting after the film breaks. Find the surface tension of the liquid.

31. A square plate of 0.1 m side moves parallel to another plate with a velocity of 0.1 ms^{-1}, both plates being immersed in water. If the viscous force is 2×10^{-3} N and viscosity of water is 10^{-3} Nsm^{-2}, find their distance of separation.

(6 × 4 = 24 Marks)

SECTION – D

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

32. Explain moment of inertia of a rotating body. What is its physical significance? Find the moment of inertia of a solid sphere about (a) its diameter (b) a tangent.

33. Derive an expression for the period of oscillation of a compound pendulum.

34. What is a cantilever? Derive an expression for the depression produced at the free end of cantilever loaded at its free end.

35. Describe Jaeger's method for measuring the surface tension of liquid.

(2 × 15 = 30 Marks)