(Pages : 4) **P – 7702**

ALL SAINTS COLLEGE LIBRARY
No.
TRIVANDRUM

Reg. No. : .....

Name : .....

First Semester B.Sc. Degree Examination, March 2023

First Degree Programme under CBCSS

Physics

Complementary Course for Mathematics

PY 1131.1 : MECHANICS AND PROPERTIES OF MATTER

(2018 Admission Onwards)

Time : 3 Hours Max. Marks : 80

SECTION – A

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

1. What are the uses of a fly wheel?
2. State parallel axis theorem.
3. Define radius of gyration.
4. Define simple harmonic motion.
5. Define centre of suspension of a pendulum.
6. What is bending moment?
7. What is called surface energy?
8. 'Antiseptics have low surface tension'. Why?

9. Why mercury does not wet glass?

10. A tiny liquid drop is spherical but a larger drop has oval shape. Why?

(10 × 1 = 10 Marks)

SECTION – B

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

11. Why the circular ring has more moment of inertia than a circular disc?

12. Obtain an expression for moment inertia of a uniform bar of rectangular cross section.

13. Obtain an expression of, kinetic energy of rotating body.

14. What is progressive wave and its types?

15. What is compound pendulum? Write the time period of a compound pendulum.

16. How do you find the acceleration due to gravity using bar pendulum?

17. What are the limitations of Poiseulli's formula?

18. How does Young's modulus increase?

19. How is Poiseulli's equation used in determining the relative viscosity?

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

21. What is the difference between free oscillations and forced oscillations?

22. How to measure the viscosities of liquid using an Ostwald's viscometer?

(8 × 2 = 16 Marks)

SECTION – C

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

23. Calculate the moment of inertia of a uniform circular disc of mass 500gm and radius 10 cm about axis tangent to the disc and parallel to diameter.

24. A rectangular metal hoop of mass 1 kg and radius 0.2 meter makes 10 revolutions per second about its centre. The axis of rotation being normal to the plane of the hoop. Find the moment of inertia about this axis? Also determine angular momentum about the same axis?

25. A particle moves in the potential energy field $U = U_0 - Px - Qx^2$. Find the expression for the force. Also calculate the force constant and time period.

26. If in air a plane wave of frequency 256 Hz and amplitude 1/1000 mm is produced. Calculate the radiated energy per unit volume and the energy current. Given velocity of sound= 332m/sec and density of air = 1.29kg/m^3.

27. A body having a mass of 4gm executes simple harmonic motion. The force acting on the body, when displacement is 8 cm, is 24gm. Find the period? If the maximum velocity is 500 cm/sec, find the amplitude and maximum acceleration.

28. A sphere of mass 0.8 kg and radius 0.03 m is suspended from a wire of length 1m and radius 5×10^{-4} m. If the period of torsional oscillations of this system is 1.23 sec. Calculate the modulus of rigidity of the wire.

29. A cylindrical rod of diameter 14 mm rests on two knife - edges 0.8 m apart and a load of 1 kg is suspended from its mid-point. Neglecting the weight of the rod, calculate the depression of the mid-point if Y for its material be $2.04 \times 10^{11} N/m^2$.

30. Calculate the mass of water flowing in 10 minutes through a tube of 0.1cm in diameter, 40 cm long, if there is a constant pressure head of 20 cm of water. The coefficient of viscosity of water is 0.0089 SI units.

31. Calculate the work done against surface tension force in blowing a soap bubble of 5 cm radius if the surface tension of soap solution is 0.025n/m.

($6 \times 4 = 24$ Marks)

SECTION – D

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

32. Derive an expression for moment of inertia of a rectangular bar about an axis passing through its centre of gravity and perpendicular to its length.

33. Derive the one dimensional general equation of wave motion.

34. Describe the Jaeger's method for determining the surface tension of given liquid.

35. Obtain an expression for the twisting couple per unit twist of a uniform solid cylinder.

(2 × 15 = 30 Marks)