

Reg. No. :

Name :

First Semester B.Sc. Degree Examination, November 2019

First Degree Programme under CBCSS

Complementary Course

PY 1131.1 : MECHANICS AND PROPERTIES OF MATTER

(For Mathematics)

(2014-2017 Admissions)

Time : 3 Hours

Max. Marks : 80

SECTION – A

Answer **all** questions in **1** or **2** sentences. Each question carries **1** mark :

1. Define the term **neutral axis** of bended beam.
2. Write down the expression for geometrical moment of inertia of a beam of circular cross section with radius r .
3. Define torsional rigidity.
4. Define rigidity modulus.
5. How viscosity of liquid varies with temperature?
6. Define surface tension.
7. Write down the expression to find excess pressure inside a soap bubble.

8. Write down the differential of simple harmonic motion and explain the terms.
9. Write an expression to find intensity of progressive wave and explain the terms.
10. Write the general equation of plane progressive wave and explain the terms.

(10 × 1 = 10 Marks)

SECTION – B

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

11. State and explain Parallel axis theorem.
12. Why girders are made in the form of letter I.
13. What are the limitations of Poiseuille's formula?
14. Briefly discuss about viscosity and viscous force.
15. What you mean by radius of gyration.
16. State and explain simple harmonic motion.
17. Obtain expression for **average** value of potential energy of a particle undergoing simple harmonic motion.
18. Derive an expression for time period of torsion pendulum.
19. Explain the variation of potential and kinetic energy with displacement for a particle executing SHM.
20. Briefly discuss about spherical wave.
21. What you mean by zero point energy of molecule?
22. Briefly explain about compound pendulum.

(8 × 2 = 16 Marks)

SECTION – C

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

23. A circular ring of diameter 20 cm and mass 2 kg is rotating with a rate of 5 revolutions per second about an axis perpendicular to its plane passing through the centre. Find the work to be done to stop the ring with in 10 seconds.
24. Find the moment of inertia of uniform circular disc of radius R about an axis passing through the centre and perpendicular to its plane.
25. A cantilever depressed by 10 mm at the free end. Calculate the depression at the middle end of cantilever.
26. The couple required to twist one end of wire of length 1 m and radius 1.5 mm through an angle of 90° is 0.6 Nm. Calculate the rigidity modulus of the material of wire.
27. If the excess pressure inside the spherical bubble of radius 1 cm is balanced by that due to a column of oil with density 800 kg/m^3 and 2 mm high. Find the surface tension of soap bubble.
28. Calculate the mass of water flowing in 10 minutes through a tube 0.1 cm radius and 1 m length. The constant pressure applied is 3000 N/m^2 . The coefficient of viscosity of water is 0.00089 SI unit.
29. Maximum velocity of particle executing SHM is 3 m/s and period is 1 s. Find the amplitude and maximum acceleration.
30. A solid cylinder of radius 10 cm is suspended by vertical wire. Axis of cylinder is along the wire. Find the couple per unit twist of the wire. Mass of cylinder is 1 kg and period of oscillation is 3 s. Take π^2 as 10.
31. A progressive harmonic wave in a string is given by $y = 5 \sin 2\pi(0.01x - 50t)$ with length expressed in cm and time in second. Find the amplitude, frequency and velocity of wave.

(6 × 4 = 24 Marks)

SECTION – D

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

32. What is flywheel? Explain about it with a neat diagram. With proper theory explain the experiment to find moment of inertia of flywheel.
33. Derive an expression for bending moment. Derive an expression for the depression at the free end cantilever which is loaded at free end.
34. Derive an expression for excess pressure on a curved surface. Obtain the expression for it in the case of spherical and cylindrical surface.
35. With necessary theory explain about Ostwald's Viscometer. With necessary theory explain how it is used to compare the viscosities of two liquid.

(2 × 15 = 30 Marks)
