(Pages : 3) H – 2097

Reg No .....

Name .....

First Semester B.Sc. Degree Examination, November 2019

First Degree Programme Under CBCSS

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. Define moment of inertia.
2. Write an expression for moment of inertia of a circular disc.
3. Define periodic motion.
4. What is energy density of a wave?
5. Define Hook's law.
6. Define Poisson's ratio. What is the theoretical limit of poisons ratio.
7. What is meant by cohesive force?
8. Why mercury won't wet a glass surface while water wet the surface?
9. What do you meant by viscous force?
10. Define coefficient of viscosity.

(10 × 1 = 10 Marks)

P.T.O.

SECTION – B

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

11. State and explain parallel axis theorem.

12. Obtain an expression for the moment of inertia of a disc about any diameter.

13. What is torsional oscillation? Obtain an expression for the period of oscillation of torsion pendulum?

14. Distinguish between transverse and longitunal waves.

15. Derive an expression for potential energy of a particle executing SHM.

16. Explain Young's modulus, bulk modulus and rigidity modulus of elasticity.

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

18. What is meant by bending moment?

19. Distinguish between streamline and turbulent flow of a liquid.

20. How temperature affect surface tension?

21. How will you determine the value of"g" using compound pendulum?

22. Obtain an expression for Poiseulli's formula.

(8 × 2 = 16 Marks)

SECTION – C

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

23. Calculate the moment of inertia of a disc of mass 1.2 Kg and radius 8cm about (a) its diameter (b) an axis parallel to a diameter and tangential to the disc.

24. A progressive harmonic wave travelling in a string is given by $y = 5 \sin 2\pi \left(\frac{x}{100} - \frac{t}{0.02}\right)$ with length expressed in cm and time in second. Find the wavelength, amplitude, frequency and velocity of wave.

25. A particle moving with simple harmonic motion has a period 0.001s and amplitude 0.5cm. Find the acceleration, when it is 0.2cm apart from its mean position and its maximum velocity.

26. Calculate the force required to stretch a 2cm diameter steel rod by 0.01 percentage. Young's modulus of steel is $2 \times 10^{11}\ N/m^2$.

27. A rod of rectangular cross section having breadth 2cm and thickness 1cm is bent in the form of an arc of radius 10m. If the young's modulus is $10^{11}\ N/m^2$, find the stress and strain on convex surface and bending moment.

28. A soap bubble is spherical in shape and has a diameter of 10cm. If the surface tension of the surface separating soap solution and air is $40 \times 10^{-3}\ N/m$. What is the excess pressure of the air in the bubble over the atmospheric pressure?

29. A capillary tube 10^{-3}m diameter and 0.2m in length is fitted horizontally to a vessel kept full of alcohol of density $0.8 \times 10^{3}\ kg/m^3$. The capillary tube is 0.3m below from the surface of the alcohol in the vessel. Calculate the volume of the alcohol flows in 5 minute.

30. An air bubble of radius 1cm is allowed to rise through a long cylindrical column of viscous liquid and travel at a steady rate of 0.21cm/s. If the density of the liquid is 1470kg/m^3, find the viscosity of the liquid. Neglect the density of the air.

31. Calculate the radius of gyration of a disc of mass 1 .2 Kg and radius 8cm about (a) its diameter (b) an axis parallel to a diameter and tangential to the disc.

(6 × 4 = 24 Marks)

SECTION – D

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

32. What is the difference between simple pendulum and compound pendulum? Obtain an expression for the period of oscillation of a compound pendulum.

33. Define a cantilever. Obtain an expression for the depression of a beam supported at its ends and loaded in the middle.

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

35. Derive an expression for the moment of inertia of a fly wheel.

(2 × 15 = 30 Marks)