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F – 1900

Reg. No. :

Name :

First Semester B.Sc. Degree Examination, November 2018
First Degree Programme Under CBCSS
PY 1131.3 : MECHANICS AND PROPERTIES OF MATTER
Complementary Course for Statistics
(2018 Admission)

Time : 3 Hours

Max. Marks : 80

PART – A

Answer **all** questions. **Each** question carries **one** mark.

1. Define radius of gyration.
2. Write the relation between angular momentum and moment of inertia.
3. Define Simple Harmonic Motion.
4. What are standing waves ?
5. Distinguish between longitudinal and transverse waves.
6. What do you mean by a cantilever ?
7. What is compressibility ?
8. A spring is made of steel and not of copper. Why ?
9. Define Surface tension. Give its unit and dimension.
10. Define terminal velocity.

PART – B

Answer **any eight**. **Each** question carries **2** marks.

11. State and prove parallel axis theorem.
12. Define moment of inertia of a rigid body. Give the MI for an annular disc about an axis passing through its centre and perpendicular to its plane.

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13. What are torsional oscillations ? Write the equation for g by torsional oscillations.
14. Show that the total energy of a simple harmonic oscillator is a constant.
15. When a wave travels from one medium to another, does the wavelength or frequency change ? Explain.
16. Explain the factors on which the frequency of a stretched string depends ?
17. Define Bending moment. Obtain the equation.
18. Draw and explain the stress-strain graph.
19. Define Young's modulus of the material of a uniform bar and obtain its general formula.
20. Distinguish between adhesive force and cohesive force.
21. Define surface tension. How it is related to Surface Energy ?
22. Derive Stokes law using the method of dimensions.

PART – C

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

23. A solid cylinder of mass 20 kg rotates about its axis with an angular speed of 100/s. The radius of the cylinder is 0.25 m. What is the KE associated with the rotation of the cylinder ?
24. A uniform ring of radius 0.5 m has a mass of 10 kg and a circular disc of the same radius has a mass of 5 kg. Which body will have greater moment of inertia about its axis perpendicular to its plane ?
25. A block of mass 680 g is tied to a spring whose spring constant k is 65 N/m. The block is pulled a distance of 11 cm from the equilibrium position at $x = 0$ on a frictionless surface and released from rest at $t = 0$. What are the angular frequency, the frequency and the period of the resulting motion ?
26. A mass of 12 kg suspended by a spring oscillates with amplitude 3 cm and frequency 2 Hz. What is the elastic restoring force when the mass is at the lowest position ?
27. A steel rod, 1 m long is clamped at the middle. Fundamental frequency of longitudinal vibration is 2.53 KHz. Calculate the speed of sound in steel.



28. A stationary wave is represented in SI by $y = 0.12 \sin(\pi/3) \times \cos 40\pi t$. Find its wavelength, frequency and speed. Also calculate its amplitude at $x = 0.75$ and 12 m.
29. A cube of soft rubber of face area 0.02 m^2 , whose lower face is sheared through an angle of 20° by a force of 104 N acting tangential to its upper face. Calculate the rigidity modulus.
30. The excess pressure inside a bubble is double that in another. Find the ratio of their volumes.
31. A flat plate is separated from a large plate with a layer of glycerine of thickness $3 \times 10^{-3} \text{ m}$. If the coefficient of viscosity of glycerine is 2 Nm^{-2} , what is the force required to keep the plate moving with a velocity $6 \times 10^{-2} \text{ m/s}$? Area of the plate is $4.8 \times 10^{-3} \text{ m}^2$.

PART – D

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

32. What do you mean by moment of inertia of a rotating body? Derive the expression for determination of moment of inertia of a flywheel.
 33. What is a compound pendulum? Explain the expression for the time period of a compound pendulum. Show that the centre of oscillation and centre of suspension of a compound pendulum are interchangeable.
 34. Define Bending moment. Obtain the expression for bending moment of a cantilever.
 35. Distinguish between streamline flow and turbulent flow. Derivation Poiseuille's formula for coefficient of viscosity of a fluid.
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