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H – 2107

Reg. No. :

Name :

First Semester B.Sc. Degree Examination, November 2019

First Degree Programme under CBCSS

Complementary Course for Statistics

PY 1131.3 – MECHANICS AND PROPERTIES OF MATTER

(2018 Admission onwards)

Time : 3 Hours

Max. Marks : 80

PART – A

(Answer all questions in one or two sentences. Each question carry 1 mark.)

1. Define radius of gyration.
2. When a metallic ball is compressed from the top and made into a disc, its moment of inertia increases. Why?
3. The oscillation of a spring is simple harmonic. Why?
4. How do you distinguish plane progressive wave and stationary wave?
5. What do you understand by the neutral surface of a loaded beam?
6. How bending moment is related Young's modulus of the material of a beam?
7. What do you understand by Viscosity?
8. Define critical velocity with regard to the flow of liquid.
9. What is the reason for capillary action of liquids?
10. What is meant by surface energy of liquid surface?

(10 × 1 = 10 Marks)

P.T.O.

PART – B

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

11. State theorem of perpendicular axes.
12. A circular disc and a circular ring of same mass and radius slide down an inclined plane, which one will reach the bottom first and why?
13. Obtain expression for the moment for inertia of a circular lamina or a disc about an axis passing through its center perpendicular to its plane.
14. Explain principle of superposition with regard to wave propagation in a medium.
15. Write the expression for the time period of a torsion pendulum. Give an application of torsion pendulum.
16. Explain the reason for the, I form of Girders?
17. What is meant by shearing strain?
18. What is the condition that the motion of a pendulum is simple harmonic and why?
19. What are the differences between a simple pendulum and a compound pendulum?
20. What is meant by angle of contact? How it is related to the shape of liquid meniscus?
21. Tiny drops of liquid are spherical while large drops have a flat surface at the top. Why?
22. Smaller air bubble will have a greater pressure inside, than a larger air bubble. Why?

(8 × 2 = 16 Marks)

PART – C

(Answer any six questions not exceeding a paragraph. Each question carries 4 marks.)

23. A circular disc of has a mass of 1 kg and radius 0.1 m is rotating at the rate of 10 revolution in a second about an axis right angle to its plane and passing through its center. Find the work done to double its speed of revolution.
24. A rod has a mass 1 kg. Find its moment of inertia about an axis passing through the center of mass and perpendicular to its length. Given that moment of inertia of the same rod about one end perpendicular to its length is 236 kg-m^2 .
25. The equation of a transverse progressive simple harmonic wave is $y = 3\sin 2\pi\left(\frac{t}{0.04} - \frac{x}{40}\right)$ where length is expressed in cm and t in second. Calculate the wave length, amplitude and speed of the wave.
26. Calculate the energy radiated per unit volume in air by a plane wave of frequency 256 Hz and amplitude 1 micrometer. Density of air = 1.29 kg/m^3 .
27. Calculate the work done in spraying a water drop of 1 mm radius into 1000 droplets of equal size. Given the surface tension of water to be 0.072 N-m .
28. What would be the excess pressure inside a small air bubble of 0.1mm radius situated in water? Surface tension of water is 0.072 N/m .
29. A light metal rod of length 50 cm and radius 1 cm is clamped at one end and loaded with 10 kg. at the free end. Calculate the depression at the free end. Take Young's modulus of the material to be $9 \times 10^{10} \text{ N/m}^2$.
30. Calculate the velocity of efflux of water from the bottom of a reservoir in which the pressure is 1960 N/m^2 , above the atmospheric pressure.
31. Water is flowing through a tube of 10 cm in diameter and 5 km in length at the rate of 120 liters per minute. Calculate the difference of pressure at the end of the tube to maintain the flow.

(6 × 4 = 24 Marks)

PART – D

(Answer **any two** questions not exceeding a paragraph. Each question carries **15** marks.)

32. Obtain the differential equation of a harmonic wave from the definition of SHM. Hence find the equation for velocity, acceleration and the displacement and energy of the particle executing SHM.
33. Describe an experiment to determine the moment of inertia of a Flywheel. Explain why the mass of a flywheel is concentrated at its rim?
34. Obtain the expression for the depression of a cantilever fixed at one end and loaded at the free end.
35. Derive Poiseuille's formula and explain experimental method of determination of the coefficient of viscosity based on Poiseuille's formula.

(2 × 15 = 30 Marks)