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Reg. No. : .....

Name : .....

First Semester B.Sc. Degree Examination, November 2018
(First Degree Programme under CBCSS)
Complementary Course for Mathematics
PY1131.1 : MECHANICS AND PROPERTIES OF MATTER
(2018 Admission)

Time : 3 Hours

Max. Marks : 80

SECTION – A

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

1. State perpendicular axis theorem.
2. Define the term neutral axis of bending beam.
3. Write an expression for geometrical moment of inertia of a beam with rectangular cross section of breadth b and thickness d.
4. Define Young's modulus.
5. Define surface tension.
6. Write down the expression to find excess pressure inside an air bubble in liquid.
7. What do you mean by viscous force ?
8. Write any two examples of simple harmonic motion.
9. Write an expression to find energy density of progressive wave and explain the terms.
10. Write the general equation of spherical wave.

(10×1=10 Marks)

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SECTION – B

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

11. Why girders are made in the form of letter I ?

12. Draw angle of twist and angle of shear in a twisted cylinder. Obtain the relation between them.

13. Why liquid drops are of spherical shape ?

14. Hot water flow faster than cold water. Why ?

15. What do you mean by radius of gyration ?

16. Obtain differential equation of simple harmonic motion.

17. Briefly explain about torsional pendulum.

18. Obtain an expression for average kinetic energy of particle undergoing simple harmonic motion.

19. Derive an expression to find time period of compound pendulum

20. Briefly explain about intensity of wave and derive an expression for it.

21. What do you mean by torsional rigidity ? Write down the equation to find the torsional rigidity of hollow cylinder of length l outer radius r_2 and inner radius r_1.

22. Explain the variation of potential and kinetic energy with displacement for a particle undergoing simple harmonic motion. **(8×2=16 Marks)**

SECTION – C

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

23. A circular disc of radius 25 cm and mass 1 kg is rotating at the rate of 10 revolutions in a second about an axis right angle to its plane passing through the center. Find the work that must be done to increase the rate of revolution to 20 per second.

24. Find the moment of inertia of uniform circular ring of radius R about diameter.

25. A cantilever of length 50 cm is depressed by 15 mm at the loaded end. Calculate the depression at a distance 30 cm from the fixed end.

26. Two cylinders having same length and mass are made up of same material. One is hollow and other is solid. Hollow cylinder has external radius twice that of internal radius. Compare their torsional rigidity.

27. A spherical air bubble is formed in water at depth of 1 m from its surface. The diameter of bubble is 0.5 mm and the surface tension of water is 0.075 N/m. Calculate the pressure inside the bubble. Atmospheric pressure is 101300 N/m^2 and density of water is 1000 kg/m^3.

28. A liquid is flowing through a 25 cm long tube of 1 mm diameter due to a pressure of 10 cm mercury. Calculate the rate of flow of liquid. Coefficient of viscosity of the liquid is 0.05 SI unit.

29. When displacement of SHM is one half of the amplitude, what fraction of total energy will be kinetic energy ?

30. A circular disc of radius 5 cm is suspended from the centre by a vertical wire as a torsional pendulum. Find the couple per unit twist of the wire. If mass of disc is 1 kg and period of oscillation is 3 s.Take π^2 as 10.

31. In a metallic rod of density 7.5×10^3 kg/m^3 and Young's modulus 7.5×10^{10} N/m^2. Fundamental frequency produces is 200 Hz. Find the wavelength of fundamental.

(6×4=24 Marks)

SECTION – D

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

32. Derive an expression for bending moment. Describe in detail an experiment to determine Young's modulus of the material of the rod using cantilever.

33. Derive an expression for excess pressure on a curved liquid surface. Obtain an expression for it in the case of spherical and cylindrical surface.

34. Derive Poiseuille's equation. What are its limitations ?

35. Briefly explain about longitudinal waves in gas. Obtain Newton's formula to find the velocity of longitudinal wave in gas and discuss about Laplace correction.

(2×15=30 Marks)

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