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Reg. No.....

Name.....

B.Sc. DEGREE (C.B.C.S.S.) EXAMINATION, MAY 2019

Second Semester

Core Course—MECHANICS AND PROPERTIES OF MATTER

(Common for the Programme B.Sc. Physics [Model I] B.Sc. Physics [Model II] B.Sc. Physics EEM, B.Sc. Physics Instrumentation)

[2013 to 2016 Admissions]

Time : Three Hours

Maximum Marks : 60

Part A (Very Short Answer Questions)

Answer all questions.

Each question carries 1 mark.

1. What do you mean by the term "radius of gyration".
2. What is critical damping.
3. State perpendicular axis theorem.
4. What is meant by beat frequency ?
5. Define Young's modulus.
6. Define and briefly explain Poisson's ratio.
7. What are the characteristics of lubricants ?
8. What is the practical significance of resonance ?

(8 × 1 = 8)

Part B

Answer any six questions.

Each question carries 2 marks.

9. What is centripetal and centrifugal forces ? Write down expressions and explain.
10. What is a compound pendulum ? Explain.
11. Explain the principle of flywheel.
12. Is an oscillator in vacuum an example of a damped harmonic oscillator ? Why ?
13. Obtain the differential equation for simple harmonic motion.
14. Define moment of inertia. What are its dimensions ?

Turn over

15. Discuss Hook's law.
16. Arrive at the relation between surface tension and surface energy.
17. Briefly explain the molecular theory of surface tension.
18. Explain the theory of superposition of waves.

(6 × 2 = 12)

Part C

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

19. Explain the inter-changeability of the centers of suspension and oscillation of a compound pendulum.
20. A uniform torque applied on a fly wheel of moment of inertia 5 kg m^2 rotates it at the rate of 100 revolutions per minute. What is the work done by the torque ?
21. A thin uniform bar of length 120 cm is made to oscillate about an axis through its end. Find the period of oscillation and other points about which it can oscillate with the same period.
22. A cylindrical rod of length 1 m and radius 1 cm is uniformly bent into a circular arc of radius 10 m. Calculate the bending moment. Given $y = 9 \times 10^{10} \text{ N/m}^2$.
23. In an experiment with Poiseuille's apparatus the following figures were obtained. Calculate the rate at which the water is escaping. Volume of water flowing per minute = 7.08. Water head = 34.1 cm. Radius of the tube = 0.0514 cm, calculate the coefficient of viscosity.
24. A cantilever of length 60 cm is depressed by 20 mm at the loaded end. What is the depression at a distance 40 cm from the fixed end ?

(4 × 4 = 16)

Part D

*Answer any two questions.
Each question carries 12 marks.*

25. Set up the differential equation for a damped harmonic oscillator and solve it for different damping.
26. Derive Stoke's formula for the velocity of a sphere falling through a viscous liquid. Explain how this is utilized to determine the viscosity of a liquid like castor oil.
27. Derive the moment of inertia of a thin uniform rod about an axis perpendicular to its length and passing through (i) its centre of mass, and (ii) one end.
28. With necessary theory describe how you will determine the rigidity modulus of a rod is determined by static torsion method.

(2 × 12 = 24)