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Reg. No.....

Name.....

B.Sc. DEGREE (C.B.C.S.S.) EXAMINATION, MAY 2018

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—2016 Admissions]

Time : Three Hours

Maximum Marks : 60

Part A (Very Short Answer Questions)

Answer all questions.

Each question carries 1 mark.

1. State parallel axis theorem.
2. What is over damping ?
3. Differentiate between uniform and non-uniform bending.
4. State the principle of Kater's pendulum.
5. State the factors affecting the surface tension of a liquid.
6. A spring is executing SHM with an amplitude A . What is its displacement at which potential energy is half its maximum value ?
7. What are forced oscillations ?
8. What is the moment of Inertia of a disc of radius r and mass m about a diameter as axis ?

(8 × 1 = 8)

Part B

Answer any six questions.

Each question carries 2 marks.

9. Explain the effect of finite arc of swing on the period of Kater's pendulum.
10. The mass of a flywheel is usually concentrated at the rim. Why ?
11. Explain couple per unit twist for torsional oscillations.
12. Express Stoke's formula.
13. Two circular discs have their masses in the ratio 1:2 and their diameters in the ratio 2:1. What is the ratio of their moment of inertia ?
14. Explain elastic fatigue. Differentiate it from elastic limit.
15. Define : (a) Amplitude ; (b) Frequency ; (c) Time period ; and (d) Phase of a body executing SHM.

Turn over

16. What is meant by radius of gyration? What is its physical significance ?
17. Why do you find cloud particles floating in the sky ? Explain.
18. What is resonance? State and explain the conditions for resonance.

(6 × 2 = 12)

Part C

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

19. Prove the theorem of perpendicular axes.
20. A thin uniform rod of length 1 m. and mass 2 kg. is allowed to rotate. The axis of rotation passes through the center of mass of the rod and perpendicular to its length. Calculate moment of inertia.
21. A flywheel of mass 500 kg. and 2 m. diameter makes 500 revolutions per minute. Assuming the mass to be concentrated at the rim, calculate the angular velocity, the energy and moment of inertia of the flywheel.
22. A body having a mass of 10 g. executes S.H.M. The force acting on the body when the displacement is 6 cm. is $32g$ wt. Find the period if the maximum velocity is 500 cm/s. Find the amplitude and maximum acceleration. (Given $g = 9.81 \text{ m/s}^2$).
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 co-efficient of viscosity.
24. A bar of length 1 m, breadth 3 cm. and thickness 4 mm. is used as a Cantilever. Calculate the depression at the free end when a load of 250 gm. is attached to the free end. Young's modulus of the material of the bar is $0.9 \times 10^{10} \text{ N/m}^2$.

(4 × 4 = 16)

Part D

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

25. Derive an expression for period of a compound pendulum and show that the centre of suspension and centre of oscillation can be interchanged. How do you measure the acceleration due gravity with a compound pendulum?
26. What do you mean by simple harmonic oscillator ? Derive the equation of motion for SHM. Find the expression for angular frequency and energy of a simple harmonic oscillator.
27. Derive the formula for the flow of a liquid through a capillary tube.
28. With necessary theory describe how you will determine the rigidity modulus of a rod is determined by static torsion method.

(2 × 12 = 24)