E 6499

Reg. No.............................

Name................................

B.Sc. DEGREE (C.B.C.S.S.) EXAMINATION, MAY 2017

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 Admission onwards)

Time : Three Hours

Maximum Marks : 60

Part A (Very Short Answer Questions)

Answer all questions.
Each question carries 1 mark.

1. State the principle of Kater's pendulum.

2. Explain perpendicular axis theorem.

3. What is over damping ?

4. Explain Doppler Effect.

5. Give the significance of cantilever method.

6. What are torsional oscillations ? Explain.

7. State the factors affecting the surface tension of a liquid.

8. What are the characteristics of lubricants ?

$(8 \times 1 = 8)$

Part B

Answer any six questions.
Each question carries 2 marks.

9. What is a seconds pendulum ? Explain.

10. Explain the principle of flywheel.

11. Bring out resonance in sound with an example.

12. Explain the theory of superposition of waves.

13. Differentiate between periodic and oscillatory motions.

14. What is uniform bending ? Illustrate.

15. Explain couple per unit twist for torsional oscillations.

16. Briefly explain the molecular theory of surface tension.

17. Why do you find cloud particles floating in the sky ? Explain.

18. Express Stoke's formula.

$(6 \times 2 = 12)$

Part C

Answer any four questions.
Each question carries 4 marks.

19. The length between the knife edges of a Kater's pendulum is 89.28 cm, while the times of oscillation about the two edges are 1.920 s and 1.933 s respectively. Calculate the value of g if the centre of gravity of the pendulum is about 54.4 cm from one edge.

20. A uniform torque applied on a fly wheel of moment of inertia 5 kg m² rotates it at the rate of 100 revolutions per minute. What is the work done by the torque ?

21. An under damped oscillator has its amplitude reduced to one over ten of its initial value after 100 oscillations. If the period is 2 seconds calculate the damping constant and decay modulus.

22. Plane progressive harmonic sound wave of frequency 256 Hz and amplitude 10^{-5} m are propagating in air of density 1.293 kgm⁻³ with velocity 348 m/s. Find the average energy density.

23. A uniform rod of length 1.2 m and radius one cm. is clamped horizontally at one end. A weight of 0.2 kg is attached to the free end. Find the depression at the free end.

24. In an experiment with Poiseulle'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.

$(4 \times 4 = 16)$

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. Set up the differential equation for forced harmonic oscillator and solve it. Hence arrive at the condition for resonance.

27. Deduce the relation for the depression at the middle of a uniform beam loaded at the centre and supported at the ends.

28. Derive Stoke's formula for the velocity of a sphere falling through a viscous liquid. Explain how this is utilised to determine the viscosity of a liquid like castor oil.

$(2 \times 12 = 24)$