QP CODE: 26020945

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Reg No : .....

Name : .....

B.Sc DEGREE (CBCS) REAPPEARANCE/ MERCY CHANCE EXAMINATIONS, APRIL 2026

Second Semester

Complementary Course - PH2CMT02 - PHYSICS - MECHANICS AND SUPERCONDUCTIVITY

(Common for B.Sc Chemistry Model I, B.Sc Geology Model I)

2017 Admission Onwards

999CEBB4

Time: 3 Hours

Max. Marks : 60

Part A

*Answer any **ten** questions.*

*Each question carries **1** mark.*

1. What is force? How is it related to the acceleration of a body?
2. What is meant by centripetal acceleration? Give an expression for the same?
3. Define angular displacement. Give its unit.
4. Define angular acceleration. Give its unit.
5. If the diameter of a flywheel was increased by 2%, then discuss if any changes occur in its M.I about the axis of symmetry.
6. Plot the variation of potential and kinetic energies with displacement of a harmonic oscillator?
7. What do you meant by free oscillstions? Define natural frequency?
8. Explain the term "resonance" related to forced harmonic oscillator.
9. What is meant by transverse waves? Give one example.
10. Prove that a superconductor is a perfect diamagnet?
11. What are high temperature superconductors? Give examples.
12. Write down two applications of superconducting material?

(10×1=10)

Part B

*Answer any **six** questions.*

*Each question carries **5** marks.*

13. State and prove the theorm of parallel axes. Hence derive the moment of inertia of a rectangular bar about an axis passing through one of its ends and through its centre.

14. State the expression for the moment of inertia of a uniform cylinder of length l and radius R about an axis through its centre and normal to its length. If the above moment of inertia to be minimum, determine the ratio l/ R , when the mass of the cylinder is kept constant and show that the ratio is $\sqrt{3} : \sqrt{2}$

15. Two identical spheres each of mass 1.2 Kg and radius 10 cm are fixed at the ends of a light rod so that the separation between the centers is 50 cm. Find the moment of inertia of the system about an axis perpendicular to the rod passing through its middle point.

16. Obtain the differential equation of simple harmonic oscillator and give its solution?

17. A body of mass 200 g is executing SHM along a straight line. At distances 6 cm and 12 cm from the mean position velocities of the body are 2 m/s and 1 m/s respectively. Find the time period and frequency?

18. If in air, a plane wave of frequency 256 Hz and amplitude 1/1000 mm is produced. Calculate the radiated energy per unit volume and the intentsity of the wave. (velocity of sound = 332 m/s, density of air = 1.29 kg/m^3)

19. A car moving at a speed of 90 km/hr sounds its horn which has a frequency 500Hz. Find the frequency heard by a stationary observer when (i) the car approaches and (ii) When the car recedes the observer. Given, the velocity of sound in air = 340 m/s.

20. A superconducting lead has a critical temperature of 7.26 K at zero magnetic field and a critical field of 8×10^5 A/m at 0 K. Find the critical field at 5 K?

21. Explain Josephson's effect? Calculate the frequency of the ac current produced when a dc voltage of 5μV is applied across the Josephson junction.

(6×5=30)

Part C

*Answer any **two** questions.*

*Each question carries **10** marks.*

22. What is an asymmetric compound pendulum? Derive an expression for the time period of the pendulum.

23. Determine the moment of inertia of a circular ring about an axis passing through the centre and perpendicular to its plane and about a diameter.

24. Explain with theory the formation of beats.

25. What is Meissner effect? Show that superconductors exhibit perfect diamagnetic behavior. Discuss the BCS theory of superconductivity.

(2×10=20)