

QP CODE: 24019211



Reg No : .....

Name : .....

**B.Sc DEGREE (CBCS) REGULAR / IMPROVEMENT / REAPPEARANCE  
EXAMINATIONS, MAY 2024**

**Second Semester**

**Complementary Course - PH2CMT02 - PHYSICS - MECHANICS AND  
SUPERCONDUCTIVITY**

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

2017 ADMISSION ONWARDS

336E5539

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. Obtain the relation connecting torque and angular acceleration.
3. State the law of conservation of momentum.
4. What are the factors on which the moment of inertia of a body depends on?
5. Obtain the moment of Inertia of a solid cylinder about an axis passing through the centre of mass and perpendicular to its length..
6. Define phase and initial phase.
7. State the differential equation of damped harmonic oscillator.
8. A longitudinal wave can propagate through any solid, liquid or gaseous media. Why?
9. What do you meant by Beats?
10. Give the schematic representation of the critical magnetic field as a function of temperature for the case of the superconducting material.
11. Explain Meissner effect.
12. Draw the magnetization curve in a type I superconductor.

(10×1=10)



### Part B

Answer any **six** questions.

Each question carries **5** marks.

13. Determine the moment of inertia of a thin rod about an axis passing through its centre and perpendicular to its length.
14. 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.
15. A couple of 10N is applied to a flywheel of mass 10kg and radius of gyration 50cm. Find the resultant angular acceleration.
16. A particle executes a simple harmonic motion of time period T. Find the time taken by the particle to go directly from its mean position to half the amplitude.
17. Prove that the total energy of a simple harmonic oscillator is independent of the displacement of the particle.
18. What do you mean by a driven / forced harmonic oscillator? Derive the differential equation for a forced harmonic oscillator and explain the various terms involved.
19. The speed of a car moving very fast is 90 km/hr. The frequency of its horn is 500 Hz. Determine the frequency of the horn heard by a driver in another car travelling at 72 km/hr in the opposite direction (i) before crossing and (ii) after crossing each other. Given that the velocity of sound in air is 340 m/s.
20. Explain the BCS theory of superconductivity.
21. What are the applications of superconductivity? Write a note on high temperature superconductivity.

(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. Obtain the expression for the moment of inertia of a thin circular disc about a diameter.
24. What do you mean by a plane progressive wave? Obtain an expression for the energy density of a plane progressive wave.
25. What is Josephson tunneling? Discuss dc and ac Josephson effects.

(2×10=20)