

B. Sc. DEGREE END SEMESTER EXAMINATION - MARCH 2024**SEMESTER 2 - PHYSICS (COMPLEMENTARY FOR CHEMISTRY)****COURSE : 19U2CPPHY04 - MECHANICS AND SUPERCONDUCTIVITY***(For Regular - 2023 Admission and Improvement /Supplementary – 2022/2021/2020/2019 Admissions)*

Time : Three Hours

Max. Marks: 60

PART A**Answer any 8 (2 marks each)**

1. Give three applications of beats.
2. Explain the term sharpness of resonance.
3. What is the physical significance of Moment of Inertia?
4. Define the term intensity or energy flux of a wave.
5. On what factors M.I of a body depend?
6. Explain forced harmonic oscillator.
7. What do you mean by radius of gyration? What is its unit?
8. Draw the magnetization curve of type I and II superconductors.
9. What are sonic booms?
10. Give expressions for the velocity and acceleration of a simple harmonic oscillator.

(2 x 8 = 16)**PART B****Answer any 6 (4 marks each)**

11. A square board of side 2m is hinged along its upper edge and is made to oscillate in a vertical plane. Determine the period of oscillation.
12. A superconducting material has a critical temperature of 4K at zero magnetic field and a critical field of 0.04 Tesla at 0K. Find the critical field at 2K.
13. Wavelengths of two notes in air are 80/195 m and 80/193 m. Each note produces five beats per second with a third note of a fixed frequency. Calculate the velocity of sound in air.
14. Two express trains travelling at 100 km/h are meeting each other while one of them is whistling. If the frequency of the note is 800 Hz, find the apparent pitch as heard by an observer in the other train (a) before the trains meet and (b) after they pass each other. Velocity of sound in air is 340m/s.
15. A particle in S.H.M makes 300 vibrations/ minute and amplitude of 5cm. Calculate the kinetic energy and potential energy when the displacement is 1 cm. Mass of the particle is 10g.
16. A wheel is making revolutions about its axis with uniform angular acceleration. Starting from rest it attains 200 rev/s in 5 seconds. Find the angular acceleration and the angle turned during this time.
17. A thin uniform rod of mass 1kg and length 2m is bent to form a square. Calculate the M.I of the square about an axis passing its centre and perpendicular to its plane.
18. The equation of motion of a damped harmonic oscillator is given by $d^2x/dt^2 + 2dx/dt + 5x$. Find period and frequency.

(4 x 6 = 24)

PART C

Answer any 2 (10 marks each)

19. Define simple harmonic motion. Set up the differential equation and find the expressions for its velocity, displacement and period.
20. What is Meissner Effect? Show that the superconductors exhibit perfect diamagnetic behavior. Discuss the BCS theory of superconductivity.
21. What is a flywheel? Explain its working and theory.
22. Discuss an experiment to determine the acceleration due to gravity using an asymmetrical compound pendulum.

(10 x 2 = 20)