B.Sc DEGREE (CBCS) REGULAR / IMPROVEMENT / REAPPEARANCE EXAMINATIONS, MAY 2023

Second Semester

Complementary Course - PH2CMT02 - PHYSICS - MECHANICS AND SUPERCONDUCTIVITY

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

2017 ADMISSION ONWARDS

210953F9

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. State the condition for maximum or minimum period for a compound pendulum.

3. Define the term radius of gyration.

4. Obtain the relation connecting torque and angular momentum.

5. The mass of a Flywheel is concentrated at its rim. Why?

6. Obtain the expression for velocity and acceleration of a simple harmonic oscillator.

7. A particle of mass m is executing SHM of frequency v . Give values of its kinetic energy, potential energy and total energy.

8. State the differential equation of damped harmonic oscillator.

9. Mention the uses of beats.

10. Explain Isotope effect?

11. Prove that a superconductor is a perfect diamagnet?

12. Draw the magnetization curve in a type II superconductor.

(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. Determine the moment of inertia of a thin rod about an axis passing through one end and perpendicular to its length?

15. 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 $\sqrt{3} : \sqrt{2}$

16. A particle of mass 20 gm executes Simple Harmonic Motion of amplitude 2 cm. If the time period is 20 s, find the total mechanical energy of the system.

17. Distinguish between transverse and longitudinal waves. Obtain the general wave equation?

18. The displacement of a particle of a string carrying a travelling wave is given by
$Y = (3.0 \text{ cm}) \sin 6.28 (0.50x - 50 t)$, where x is in centimeter and t in second. Find
(a) the amplitude
(b) the wavelength
(c) the frequency
(d) the speed of the wave

19. What is Doppler effect in sound? Give an expression for the apparent frequency when the source is stationary and the observer is moving.

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. Obtain the expression for the moment of inertia of a thin circular disc about a diameter.

23. Derive an expression for the M.I of a solid sphere about a diameter and about a tangent.

24. Set up differential equation for a forced harmonic oscillator. Explain the contribution of the various terms involved. Obtain the condition for resonance.

25. What is Josephson tunneling? Discuss dc and ac Josephson effects.

(2×10=20)