22103105

QP CODE: 22103105

Reg No : .....

Name : .....

B.Sc DEGREE (CBCS) REGULAR / IMPROVEMENT / REAPPEARANCE EXAMINATIONS, OCTOBER 2022

Second Semester

Complementary Course - PH2CMT02 - PHYSICS - MECHANICS AND SUPERCONDUCTIVITY

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

2017 ADMISSION ONWARDS

3D7ACBAC

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 a compound pendulum?
3. Define radius of gyration associated with a rotating body.
4. Define angular velocity. Give its unit.
5. What do you meant by moment of inertia of a body? Give its unit.
6. State the differential equation of damped harmonic oscillator.
7. What is meant by sharpness of resonance?
8. A longitudinal wave can propagate through any solid, liquid or gaseous media. Why?
9. Explain superposition of waves.
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. Write a short note on 'Josephson' Junction of superconductors.

(10×1=10)

Part B

*Answer any **six** questions.*

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

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

14. Suppose the moment of Inertia of the earth about the axis of rotation is 9.3×10^{37} kgm^2 and radius of the earth is 6.4×10^6 m. The earth is rotating with an angular velocity of 7.3×10^{-5} rad/s. What is the tangential force needed to stop the earth in one year?

15. A fly wheel of mass 500 Kg and diameter 1 m revolves about its axis. Its frequency of revolution is increased by 18 in 10 seconds. Calculate the torque applied (Assume the flywheel is in the form of a disc).

16. A particle executes simple harmonic motion of amplitude along x- axis at t = 0, the position of the particle is x = A/2and it move along the positive x- direction. Find the phase constant β if the equation is written as $x = A \sin(\omega t + \beta)$.

17. 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.

18. Show that for a harmonic oscillator the average potential energy is equal to the average kinetic energy.

19. Show that in a plane progressive harmonic wave half of the energy is kinetic and half potential.

20. Discuss Type I and Type II Superconductors.

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. State and prove parallel and perpendicular axes theorems of moment of inertia. Determine the moment of inertia of a rod about an axis perpendicular to its length if the axes pass through the (i) centre of mass and (ii) at one end.

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

24. What is Doppler Effect in sound? Obtain an expression for the apparent frequency (a) when the source is moving and the observer is stationary, (b) when the source is stationary and the observer is moving and (c) both the source and the observer are moving.

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

(2×10=20)