QP CODE: 20101105

20101105

Reg No : .....

Name : .....

B.Sc. DEGREE (CBCS) EXAMINATION, NOVEMBER 2020

Second Semester

Complementary Course - PH2CMT02 - PHYSICS - MECHANICS AND SUPERCONDUCTIVITY

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

2017 ADMISSION ONWARDS

F9F462B0

Time: 3 Hours Max. Marks : 60

Part A

*Answer any **ten** questions.*

Each question carries 1 mark.

1. Define the term radius of gyration.
2. Define angular displacement. Give its unit.
3. State the law of conservation of momentum.
4. Obtain the moment of inertia of a ring about its diameter.
5. In a fly wheel, most of the mass is concentrated at the rim. Explain why?
6. What is the difference between periodic motion and oscillatory motion?
7. Where does a particle executing SHM experience (1) maximum force and (2) minimum force?
8. Define resonant frequency.
9. What do you meant by Beats?
10. Prove that a superconductor is a perfect diamagnet.
11. What do you mean by vortex state in a type II superconductor?
12. Write down two applications of superconducting material?

(10×1=10)

Part B

*Answer any **six** questions.*

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

13. A mass of 0.5 kg is attached to the end of a string of length 1 m and is whirled in a horizontal circle with a uniform speed of 10 m/s. Determine the centripetal force acting on the bob.

14. A uniform meter scale is of mass 150g. What is its moment of inertia if the scale is rotated about its axis perpendicular to its length and passes through (a) the centre and (b) the 75cm mark?

15. Determine the moment of inertia of a solid cylinder about the axis of cylindrical symmetry.

16. Calculate the kinetic energy at displacement one fourth to the amplitude in case of Simple Harmonic Motion.

17. A mass of 2 kg is suspended from a spring of force constant 10^4 N/m and damping coefficient 10 Ns/m. The spring is driven by a periodic force of peak value 20 N and frequency twice the natural frequency of the system without damping. Calculate the amplitude of vibration.

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

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

20. The critical temperature for mercury with isotopic mass 202 is 4.159 K. Determine its critical temperature when its isotopic mass changes to 200.7. Assume $\alpha = 0.5$.

21. What is the frequency of the alternating current obtained from a Josephson junction, where a voltage of 2mV is applied?

(6×5=30)

Part C

*Answer any **two** questions.*

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

22. Prove that there are four points in a compound pendulum about which the time periods are same. Obtain the conditions for the minimum and maximum time periods of a compound pendulum.

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

24. Obtain the differential equation of the Simple Harmonic Motion. Derive the expression for Kinetic Energy, Potential Energy and Total Energy of a Simple Harmonic Oscillator.

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

(2×10=20)