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Reg. No..............................

Name..............................

B.Sc. DEGREE (C.B.C.S.) EXAMINATION, JUNE 2018

Second Semester

Complementary Course—Physics

PH2 CMT 02—MECHANICS AND SUPER CONDUCTIVITY

(Common to Model I Chemistry and Model I Geology)

[2017 Admissions only]

Time : Three Hours

Maximum : 60 Marks

Part A

Answer any ten questions.
Each question carries 1 mark.

1. What is meant by Acceleration ? Give its unit.

2. What do you mean by equivalent simple pendulum ?

3. Define angular displacement. Give its unit.

4. State perpendicular axes theorem.

5. What is a wave function ?

6. Define wavelength and velocity. How they are related ?

7. Define resonant frequency.

8. State the differential equation for damped harmonic oscillator.

9. Draw the resistance-temperature graph of transition from super conductor to normal material.

10. Draw the magnetization curve in a type I super conductor.

11. What is Josephson effect ?

12. What are high temperature super conductors ? Give examples.

(10 × 1 = 10 marks)

Part B

Answer any six questions.
Each question carries 5 marks.

13. A compound pendulum is formed by suspending a heavy ring from a point on its circumference. Determine the time period of oscillation if the radius of the ring is 1 m.

14. A sphere of uniform density 5520 kg/m³ and radius 6400 km, calculate the moment of inertia about its axis of rotation.

Turn over

15. Calculate the M I and radius of gyration of a disc of mass 1.2 kg and radius 8 cm about :

    (a) Its diameter.

    (b) An axis parallel to the diameter and tangential to the disc.

16. A partial of mass 20 gm executes SHM of amplitude 2 cm. If the time period is 20 s, find the total mechanical energy of the system.

17. A plane wave of frequency 256 Hz and amplitude 10^{-3}mm is produced in air. Calculate the energy density and energy flux of the wave. Given, density of air = 1.29 kgm^{-3} and velocity of sound in air = 332 ms^{-1}.

18. Consider a wave of frequency 500 Hz travelling with a velocity of 200 m/s. Find the phase change in a time interval 10^{-3} s. Also find the path difference between two points that differ by $\pi/2$ radian.

19. The critical temperature for mercury with isotopic mass 199.5 is 4.185 K. Calculate the critical temperature when its isotopic mass changes to 203.4.

20. Explain BCS theory of superconductivity.

21. What are the applications of superconductivity ? Write a note on hic Tc superconductivity.

(6 × 5 = 30 marks)

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 differential equation for SHM. Derive the expression for kinetic energy and potential energy and total energy of SHM.

24. Explain the theory of formation of beats.

25. What is Josephson tunneling ? Discuss AC and DC Josephson effects.

(2 × 10 = 20 marks)