TB146680A **Reg. No…….**

Name……....

B. Sc. DEGREE (C.B.C.S.S.) EXAMINATION, MARCH 2017

SEMESTER VI - PHYSICS

PHY6CMP – CONDENSED MATTER PHYSICS

Time: Three Hours **Maximum Marks: 60**

PART A

I. Answer all questions. Each question carries 1 mark.

1. What is a crystal lattice?
2. What is meant by inversion centre of a unit cell?
3. Explain Fermi energy?
4. State Bloch theorem.
5. What are spin waves?
6. What are high temperature superconductors? Give example.
7. Name the different types of ordering in liquid crystals.
8. What are nanocomposites? **(8x1=8)**

PART B

II. Answer any six questions. Each question carries 2 marks.

9. Why fivefold and sevenfold rotation axis don't exist in a crystal?
10. Distinguish between metallic bonding and van der Waal's bonding.
11. Give any four drawbacks of the free electron model.
12. What is meant by effective mass of an electron? Write and explain the expression for the same.
13. Give any two difference between Intrinsic and extrinsic semiconductors.
14. Derive an expression for the Gauss law in the case of a dielectric.
15. Represent the variation of magnetization M with magnetizing field intensity H for a ferromagnetic material and hence explain retentivity and coercivity.
16. Distinguish between type I and Type II superconductors.
17. Give any four applications of superconductivity.
18. What is Meissner effect? Show that superconductors exhibit perfect diamagnetic behaviour.

(6x2=12)

PART C

III. Answer any four questions. Each question carries 4 marks.

19. A substance with fcc lattice has density of 6250 kg/m^3 and molecular weight 60.2. Calculate the lattice constant 'a'. Given Avagadro's number N=6.02x10^{23} per gm-atom.

20. The Fermi energy of Lithium is 4.72eV at absolute zero. Calculate the number of conduction electrons per unit volume. Given that h= 6.63×10^{-34}J-s, m=9.11×10^{-31}kg.
21. An electric field of 100 V/m is applied to a sample of n-type semiconductor whose Hall coefficient is -0.0125 m3/Coulomb. Determine the current density. The electron mobility is 0.36 m2/V-s
22. A magnetizing field of 1600 A/m produces a magnetic flux of 2.4×10^{-5} Weber in a bar of iron of cross-section 0.2 cm^2. Calculate the permeability and susceptibility of the bar.
23. For a superconducting specimen, the critical fields at 13 K and 14 K are 4.2×10^5 A/m and 1.4×10^5 A/m respectively. Determine the transition temperature and critical field at 0K
24. What is a thin film? Discuss its properties.

(4x4=16)

PART D

IV. Answer any two questions. Each question carries 12 marks.

25. Describe the powder method for the analysis of crystal structure. What are the advantages of this method?
26. Discuss Hall effect. Obtain an expression for the Hall voltage.
27. What is ferromagnetism? Discuss the Curie-Weiss law of ferromagnetism. Explain the ferromagnetic hysteresis
28. Explain Josephson tunneling? Discuss DC Josephson effect, AC Josephson effect and SQUID.

(2x12=24)