B. Sc. DEGREE END SEMESTER EXAMINATION - MARCH 2019

SEMESTER – 6: PHYSICS (CORE COURSE)

COURSE: 15U6CRPHY11: CONDENSED MATTER PHYSICS

(Common for Regular - 2016 Admission / Supplementary-Improvement 2015/2014 admissions)

Time: Three Hours   Max. Marks: 60

PART A

Answer *all* questions; each question carries *1* mark

1. What is the ratio c/a for hcp structure?
2. Define a primitive cell.
3. Metals have positive temperature coefficient of resistance. What do you mean by this?
4. What is Hall effect?
5. What is ferroelectricity? Give an example of a ferroelectric.
6. In a dielectric, dipole moment per unit volume is called -------------------
7. What do you mean by spin waves?
8. What is a. c. Josephson effect?
9. What are liquid crystals?
10. Mention any two applications of nanomaterials.   (1 x 10 = 10)

PART B

Answer *any seven* questions; each question carries *2* marks

11. Explain the structure of Sodium Chloride
12. Give the postulates of free electron theory.
13. Define the term dielectric constant. How is it related to susceptibility?
14. Describe different sources of polarisability in a material.
15. Explain the origin of diamagnetism.
16. Explain the variation of susceptibility with temperature for antiferromagnetic materials.
17. Write a note on BCS theory of superconductivity.
18. Distinguish between quantum dots, quantum wires and quantum wells.
19. What are polymers? Discuss the effect of temperature on polymers.   (2 x 7 = 14)

PART C

Answer *any four* questions; each question carries *4* marks

20. A solid with face centred cubic structure has a molecular mass 60.2 amu. Find its lattice constant if the density of the material is 6250 kgm^{-3}.
21. Calculate the glancing angle on the (100) plane of a crystal with spacing 4.51A° corresponding to the first order diffraction maximum for x rays of wavelength 1.54A°.

22. Obtain the conductivity of a pure Ge crystal at 300K assuming that the intrinsic carrier concentration at this temperature is 2.5 x 10^{13}/cm^3. Given that the electron and hole mobilities are 3600 and 1700 cm^2/ V-s respectively.

23. Derive the Clausius – Mossotti relation connecting dielectric constant and atomic polarisability.

24. An iron rod of susceptibility 599 with an area of cross section 0.2cm^2 is subjected to a magnetizing field of 1200A/m. Determine the permeability and the magnetic flux produced.

25. Explain Critical field. How superconductors are classified based on critical field.   (4 x 4 = 16)

PART D

Answer ***any two*** question; each question carries ***10*** marks

26. Explain the formation of ionic, covalent, metallic and van der Waal bonding.

27. What is paramagnetism? Discuss the Langevin's theory of paramagnetism and obtain the Curie's law.

28. Discuss the effect of magnetic field of superconductors. Explain Meissner effect and discuss how materials are classified based on this effect.

29. What are amorphous semiconductors? Explain how they are classified and also discuss about the disorders found in them.   (10 x 2 = 20)

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