

E 6168



Reg. No.....

Name.....

B.Sc. DEGREE (C.B.C.S.S.) EXAMINATION, SEPTEMBER 2024

Sixth Semester

Core Course—CONDENSED MATTER PHYSICS

(Common for B.Sc. Physics Model I, B.Sc. Physics Model II, B.Sc. Physics EEM and
B.Sc. Physics Instrumentation)

[Prior to 2013 Admissions]

Time : Three Hours

Maximum Weight : 25

Part A

Answer all questions.

Weight 1 for each bunch.

BUNCH I

1. The nature of binding for a crystal with alternate and evenly spaced positive and negative ions is _____.
2. The nearest neighbour distance in the case of bcc structure is _____.
3. Ferromagnetic materials are called _____ magnets.
4. Superconductors are classified according to _____.

BUNCH II

5. If r is the radius of the atom in a crystal, crystallizing in a simple cubic structure, then the nearest neighbour distance is _____.
6. The number of atoms present in the unit cell of hep structure is _____.
7. The total dipole moment per unit volume of a material is _____.
8. The _____ is working on the principle of Josephson Effect.

Turn over





BUNCH III

9. The Miller indices of the plane parallel to y and z axes are _____.
10. Bragg's law is the condition to be satisfied to obtain a _____ spot.
11. The magnetic material in which permanent magnetic dipoles are already aligned due to bonding forces are known as _____.
12. The temperature at which a conductor becomes a superconductor is called _____.

BUNCH IV

13. An X-ray tube works in 60 kV. What will be minimum wavelength of X-rays emitted from it ?
14. For _____ materials susceptibility is inversely proportional to the absolute temperature.
15. The minimum magnetic field required to destroy the superconducting property is known as _____ field.
16. Value of critical current density (j_c) in a superconductor depends on _____.

(4 × 1 = 4)

Part B

Answer any five questions.

Weight 1 for each.

17. What is meant by reciprocal lattice ? Explain.
18. State Bloch theorem.
19. Differentiate Intrinsic and Extrinsic semiconductors.
20. What is Ferrimagnetism ? Explain.
21. What do you mean by Ferroelectricity ? Explain.
22. What are amorphous materials ?
23. Differentiate between Type 1 and Type 2 superconductors.
24. Explain the term critical magnetic field in a superconductor.

(5 × 1 = 5)





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Part C

*Answer any **four** questions.*

Weight 2 for each.

25. What is Paramagnetism ? Obtain Langevin's formula for paramagnetic susceptibility.
26. An iron rod of susceptibility 599×10^{-11} with an area of cross section 0.2 cm^2 is subjected to magnetising field of 1200 amp-m^{-1} . Determine the permeability and flux produced.
27. Obtain Miller indices for planes ($3a$, $3b$, $3c$).
28. The London penetration depths for Pb at 3 K and 7.1 K are respectively 39.6 nm and 173 nm. Calculate its transition temperature as well as penetration depth at 0K.
29. Explain Curie-Weiss's Law in magnetism.
30. What are thin films ? Discuss the applications and properties of thin films.

(4 × 2 = 8)

Part D

*Answer any **two** questions.*

Weight 4 for each.

31. Describe the powder method for X-ray diffraction. Discuss the formation of x-ray diffraction pattern.
32. Discuss the domain theory for ferromagnetism.
33. Discuss the Kronig-Penney model of solids in detail.

(2 × 4 = 8)

