



III Semester M.Sc. Examination, January 2018
(CBCS Scheme)
PHYSICS
P 302 : Condensed Matter Physics (General)

Time : 3 Hours

Max. Marks : 70

Instruction : Answer *all* questions, *all* Parts are **compulsory**.

PART – A

Answer **any four** of the following : (4×5=20)

1. Explain the various types of symmetry operations present in cubic crystal.
2. Define and mention the properties of reciprocal lattice.
3. What is meant by density of energy states in metals ? Explain.
4. Write charge neutrality equation for semiconductors and explain.
5. State and explain Meissner effect in super conductors.
6. Outline the Langevin theory of para-magnetism.

PART – B

Answer **any four** of the following : (4×10=40)

7. What are Laue equations for X-ray diffraction ? Derive Bragg's law; show that this equation is a special case of Laue's equations.
8. On the basis of free electron theory of metals derive expressions for electrical and thermal conductivity and hence establish Weidman-Franz law.
9. What is Bloch function ? Discuss the Kronig-Penny model for energy bands in solids.
10. Give the theory of Hall effect in semiconductors and its applications.
11. Obtain expressions for the electronic and ionic polarizabilities.
12. Discuss Weiss molecular field theory of ferromagnetism.



PART – C

Answer **any two** of the following :

(2×5=10)

13. Find Miller indices of a plane that makes an intercept of $3a$, $2a$ and c along three crystallographic axes, where a , b , c are the primitive vectors of the lattice.
 14. The relative permittivity of Argon at 0°C is 1.000543. Argon gas contains 2.7×10^{25} atoms $/\text{m}^3$ at 0°C . Calculate the polarizability of the Argon atom.
 15. A uniform copper wire of length 0.5 m and diameter 0.3 mm has a resistance of 0.2 Ohm at 293 K. If the thermal conductivity of the specimen at the same temperature is $390 \text{ Wm}^{-1}\text{K}^{-1}$. Calculate Lorentz number.
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