

M.Sc. (Physics) (CBCS Pattern) Semester-IV
PSCPHYT14 - Core-12 Paper-XIV - Solid State Physics

P. Pages : 2

Time : Three Hours



GUG/W/24/11413

Max. Marks : 80

Note : All questions are compulsory.

Either:

1. a) Discuss the Kronig-Penney model and construction of Brillouin zones. 8
- b) Describe the extended zone scheme and reduce zone scheme for representing E-K relationship. 8

OR

- e) Discuss the magnetism of iron group and rare earth ions. 8
- f) Give an account for the quantum theory of paramagnetism and discuss the low and high temperature cases. 8

Either:

2. a) Discuss the Dulong – Petit's Law. 8
- b) Deduce dispersion relationship for monoatomic one-dimensional lattice, shows that phase velocity is equal to group velocity at low frequency. 8

OR

- e) Describe Einstein model of lattice heat capacity and discuss the successes and failures of this model. 8
- f) What is Debye T^3 law of lattice heat capacity? Derive Debye T^3 law from Debye model of lattice heat capacity". 8

Either:

3. a) Discuss the Seebeck effect and describe the method of measurement of temperature by the Seebeck effect using single junction and double junction thermocouple. 8
- b) Obtain an expression for Fermi energy, total energy and density of state for free electron gas in one dimension. 8

OR

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| e) | What is an extrinsic semiconductor? Discuss the variation of the fermi level with temperature for an n-type semiconductor? | 8 |
| f) | What is Hall effect? State the importance of Hall effect? Derive the expression for Hall coefficient and mobility of charge carrier. | 8 |

Either:

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| 4. | a) | Discuss theory & quantum interference device by Ginzburg-Landau. | 8 |
| | b) | Describe the properties of type-I and type-II superconductor. | 8 |

OR

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| e) | What is Isotope effect. Describe superconducting coherence length? | 8 |
| f) | Discuss DC and AC Josephson effect. | 8 |

5. Answer **all** of the followings.

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| a) | State and prove Bloch theorem. | 4 |
| b) | What is Born procedure? | 4 |
| c) | Discuss the electrical resistivity of metals. | 4 |
| d) | What is Meissner effect? | 4 |
