



## **ED-603**

M.Sc. 3rd Semester  
Examination, March-April 2021

### **PHYSICS**

Paper - III

Solid State Physics - I

*Time* : Three Hours] [*Maximum Marks* : 80

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**Note** : Answer **all** questions. All questions carry equal marks.

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#### **Unit-I**

1. What is nearly free electron model? Explain its consequences and also discuss origin of energy gap.

**OR**

Discuss Kronnig Penny Model of movement of electron in a periodic field of crystal lattice.

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*(Turn Over)*

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**Unit-II**

2. What is free electron gas ? Discuss reduced and periodic zone schemes near zone boundary.

**OR**

What is De Haas-Van Alphen effect ? How shape of Fermi surface is determined by this effect ?

**Unit-III**

3. Write notes on any **two** of the following :
- (a) Optical and Acoustic modes
  - (b) Phonon momentum
  - (c) Inelastic neutron scattering by phonons
  - (d) Thermal resistivity of phonon gas

**Unit-IV**

4. Give the historical background of superconductivity. Explain the types of superconductivity and also discuss Meissner effect.

**OR**

What do you mean by Isotope effect ? Explain basic features of BCS theory and also define vortex state.

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**Unit-V**

5. Why semiconductors are doped? Give a suitable energy level diagram. Explain how doping by donors improve the conductivity of semiconductors.

**OR**

Write notes on the following :

- (a) Thermal ionizations of Acceptors
- (b) Thermoelectric effects