UNIVERSITY OF THE PUNJAB

B.S. 4 Years Program / Eighth Semester – 2019

Roll No. in Fig. .....

Roll No. in Words. .....

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Signature of Supdt.:

Paper: Solid State Physics-III
Course Code: PHY-439 Part – I (Compulsory) **Time: 15 Min. Marks: 10**

ATTEMPT THIS PAPER ON THIS QUESTION SHEET ONLY.
Division of marks is given in front of each question.
This Paper will be collected back after expiry of time limit mentioned above.

Q.1. Encircle the correct option. **(10x1=10)**

A) According to classical model of specific heat capacity of solids, C_v of all solids

i) depends on temperature ii) do not depend on temperature iii) exhibits infinite value iv) none of these

B) Einstein model of heat capacity fits well with experimental results for

i) low temperatures ii) high temperatures iii) low and high temperatures iv) infinite temperatures v) none of these

C) According to Debye model of heat capacity, C_v approaches to zero as

i) T^4 ii) T^3 iii) T^2 iv) T v) none of these

D) Which of the following models enumerates the density of states to calculate specific heat capacity of a material C_v?

i) Classical model ii) Einstein model iii) Debye model
iv) Heisenberg model v) none of these

E) At high frequencies, the dipolar and ionic contribution into total polarizability is

i) zero ii) small iii) large iv) infinite v) None of these

F) Which of the following combination of quantities are dimensionless?

i) Dielectric constant and electric susceptibility ii) Dielectric constant and dipole moment iii) Dielectric constant and electric field iv) Dielectric constant and polarization v) none of these

G) For a given shape of a dielectric material, the depolarization factor is always

i) positive ii) negative iii) infinite iv) equal to zero v) none of these

H) In semiconductors, the electrical conductivity

i) decreases with temperature ii) increases with temperature iii) does not depend on temperature iv) none of these

I) The electric dipole moment per unit electric filed is defined as?

i) Polarizability ii) Dipolar field iii) Polarization iv) Dielectric constant

J) The depolarization field is

i) in same direction to polarization ii) opposite to polarization iii) always in random direction iv) none of these

UNIVERSITY OF THE PUNJAB

B.S. 4 Years Program / Eighth Semester – 2019

Roll No. .....

Paper: Solid State Physics-III
Course Code: PHY-439 Part – II

Time: 2 Hrs. 45 Min. Marks: 50

ATTEMPT THIS (SUBJECTIVE) ON THE SEPARATE ANSWER SHEET PROVIDED

Q.2 Give to the point answer / short description of each question. **(4 × 5 = 20)**

a) Discuss briefly free electron approximation in magnetic fields.

b) Explain De Haas van Alphan effect in solids.

c) Differentiate between inter-band and intra-band transitions.

d) What is meant by Polarons? Explain briefly.

e) Explain quantum Hall effect briefly?

Q.3

Discuss electron-phonon interactions in solids and derive an expression for Hamiltonian of such interaction by considering periodicity of lattice. **(10)**

Q.4

Discuss semi-classical model of conduction in metals? Derive Boltzmann transport equation and explains the terms appearing in it. **(10)**

Q.5

Discuss Pauli paramagnetism of conduction electrons and derive an expression for Pauli spin magnetization of conduction electrons. **(10)**