



UNIVERSITY OF THE PUNJAB

Seventh Semester – 2019

Examination: B.S. 4 Years Program

Roll No. in Fig.

Roll No. in Words.

PAPER: Solid State Physics-II

Course Code: PHY-421 Part-I (Compulsory)

MAX. TIME: 15 Min.

MAX. MARKS: 10

Signature of Supdt.:

Attempt this Paper on this Question Sheet only.

Please encircle the correct option. 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 right answer, cutting and overwriting is not allowed. (1x10=10)

1. Cooper pairs act as bosons and have spin

- (a) $n/2$ (b) n (c) zero (d) none

2. A superconductor is Type-II if surface energy is.....with the increasing magnetic field

- (a) positive (b) negative (c) zero (d) none

3. The quantum of flux in a superconducting ring in (CGS) is

- (a) 2.076×10^{-14} tesla-m² (b) 2.0678×10^{-7} gauss-cm² (c) both (d) none

4. In superconductors the energy gap is associated with

- (a) Fermi gas (b) lattice (c) both (d) none

5. The exciton can transport

- (a) momentum (b) temperature (c) charge (d) all above

6. The function $\alpha'(\omega)$ is W.r.t real ω

- (a) Even (b) odd (c) periodic (d) Non periodic

7. Electron and hole combine to form an exciton in

- (a) 40μ s (b) 8μ s (c) 1ns (d) 1μ s

8. The exciton gas is insulator at pressure

- (a) low (b) zero (c) high (d) none

9. The crystals in which ferroelectric dipole moment is not sensitive to the electric field, instead varies with temperature are called as

- (a) ferroelectric (b) para-electric (c) anti-ferroelectric (d) pyroelectric

10. The macroscopic electric field is sum of applied field and

- (a) Depolarization field (b) Lorentz field (c) both (d) none



UNIVERSITY OF THE PUNJAB

Seventh Semester – 2019

Examination: B.S. 4 Years Program

Roll No.

PAPER: Solid State Physics-II

Course Code: PHY-421 Part – II

MAX. TIME: 2 Hrs. 45 Min.

MAX. MARKS: 50

ATTEMPT THIS (SUBJECTIVE) ON THE SEPARATE ANSWER SHEET PROVIDED

Q.2: Please give short answers to the following questions.

(2×10 = 20)

- Differentiate the ground state of a superconductor and normal conductor.
- Which of the two (normal or superconducting) states of a metal are more ordered? Explain.
- Describe the role of mass of nuclei on the critical temperature of the superconductors?
- How does the Type-I to Type-II superconducting transition occurs due to doping?
- Differentiate between single particle tunneling and pair particle tunneling.
- What are the sequences of events when electron-hole drop is formed?
- Describe the possible ways used to calculate the binding energy of excitons?
- Define excitons and describe examples of crystals having Frenkel excitons.
- Write down important lengths that play important role in theory of superconductivity.
- Discuss ferroelectric domains.

Question no.3

(10+5)

- How would you reach to mathematical expression which shows that a DC current flows across the junction in the absence of any electric or magnetic field.
- Describe microwave and infrared properties of superconductors

Question no.4

(10+5)

- Derive the expression used to estimate H_{C1} and H_{C2} for a Type-II superconductors
- Using the definition of atomic polarizability, derive Clausius-Mossotti relation.