

- (b) What is the AC-Josephson effect ? 3
 (c) Discuss in brief the BCS theory. 5

OR

- (p) Derive the London equation. 8
 (q) Discuss the following properties of superconductors : 1. Superconducting band gap and 2. Persistent current. 4
 (r) What is the Flux Quantisation ? 4



AQ - 967

Third Semester M.Sc. (Part - II) (CBCS Scheme)
 Examination

CONDENSED MATTER PHYSICS - I

Paper - 3 PHY 4 (ii)

P. Pages : 4

Time : Three Hours]

[Max. Marks : 80

[Credit : 04

Note : All questions are compulsory and carry equal marks.

1. (a) Distinguish metals, semiconductors and insulators based on energy level band's structure. 6
 (b) Give Kronig-Penney model to explain presence of energy level band structure separated with forbidden energy gaps. 8
 (c) What is crystal momentum ? 2

OR

- (p) Derive relation for allowed energy levels under tight binding approximation and explain its application to simple cubic structure. 10
 (q) Discuss the concept of Fermi surface. 3
 (r) Discuss the significance of negative effective mass. 3

2. (a) What is magnetic susceptibility ? Distinguish between diamagnetic, paramagnetic, ferromagnetic, and ferrimagnetic materials based on magnetic susceptibility and its variation with temperature. 6

(b) Give classical theory of diamagnetism. 8

(c) What is magnetic moment ? 2

OR

(p) Give quantum theory of paramagnetism. 10

(q) Discuss about quenching in iron group ions. 4

(r) What is Larmor precession ? 2

3. (a) What is spontaneous magnetization ? 3

(b) Derive relation between exchange integral J_e and molecular field constant λ . 7

(c) What is hysteresis ? Explain it with the help of ferromagnetic domain. 6

OR

(p) Give Weiss theory of spontaneous magnetization. 7

(q) Discuss in detail the origin of ferromagnetic domains. 4

(r) What are spin waves ? Discuss about its quantization. 5

4. (a) What is macroscopic electric field ? 3

(b) What is local electric field ? 3

(c) What is polarisation ? 2

(d) Derive Clausius-Mosotti relation. 8

OR

(p) Discuss about antiferroelectricity. 4

(p) What is meant by spontaneous polarization ? 4

(q) Distinguish between piezoelectricity and ferroelectricity. 4

(r) Explain the mechanism of piezoelectricity. 4

5. (a) What is Coherence length ? Derive the relation for it. 8