Seat No. _____

HQ-1603010802020800

M. Sc. (Sem. II) Examination

April - 2023

Physics : CT - 08

(Solid State Physics)

Time : $2\frac{1}{2}$ / Total Marks : **70**

Instructions : (1) Attempt all questions.
(2) All questions carry equal marks.
(3) Mathematical symbols have equal meanings.

1 Answer in brief any seven : **14**

(a) What are amorphous and crystalline solids? **02**

(b) Draw (111) and (200) miller planes for simple cubic unit cell. **02**

(c) What are three different diffraction methods? **02**

(d) Write names of two different plane defects in the solids. **02**

(e) Draw energy band structure for semiconductors and insulators. **02**

(f) What are critical temperature and critical current? **02**

(g) What is dc Josephson junction? **02**

(h) Why diamagnetic materials possess negative susceptibility? **02**

(i) Write different contributions for total paramagnetic moment. **02**

(j) What is Slater's criterion? **02**

2 Answer any two of following questions: **14**

(a) Discuss in brief (i) zero electrical resistance, (ii) persistent current, (iii) critical field, (iv) Meissner effect and (v) isotope effect in superconductors. **07**

(b) Describe (i) London equations and (ii) flux penetration. **07**

(c) Explain qualitative BCS theory of superconductivity. Comment on the BCS ground state. **07**

3 (a) Discuss in detail vacancy defects in solids. **07**

(b) Write a note on Schottky defects in solids. **07**

OR

(a) Discuss in brief line defects in solids. Explain Fick's laws of diffusion. **07**

(b) Write a note on Kronig Penney model. **07**

4 Answer any two of following questions: **14**

(a) Write a note on symmetry elements for crystalline solids. **07**

(b) Explain three different experimental set ups for XRD experiment. **07**

(c) Discuss the scattering of X-rays. Provide explanation for atomic scattering factor. **07**

5 Answer any two of following questions: **14**

(a) Discuss various contributions of paramagnetic moment for paramagnetic materials. **07**

(b) Write a note on Langevin's classical theory of paramagnetism. **07**

(c) Describe the relationship between Tc and λ for ferromagnetic materials. Write a note on ferrimagnetic materials. **07**

(d) Discuss in detail the Weiss molecular field theory. **07**
