

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
I B. Tech I Semester Supplementary Examinations June 2025
ENGINEERING PHYSICS

(Common to CSE, IT, CSE-AI&ML, CSE-AI, CSE-DS, CSE-AI&DS, AI&DS&AI&ML)

Time: 3 hours

Max. Marks: 70

Question paper consists of Part A, Part B.
Part A is compulsory, Answer all questions.
In Part B, Answer any one question from each unit.

PART-A**(20 Marks)**

- 1 a) What are the applications of interference in thin films? [2]
- b) Define diffraction and distinguish between single slit and double slit diffraction patterns. [2]
- c) What are the seven crystal systems in crystallography? [2]
- d) Define the term unit cell and explain its significance. [2]
- e) What is polarization vector and how is it expressed in terms of susceptibility? [2]
- f) What is meant by magnetic susceptibility? [2]
- g) Define wave function and explain its physical interpretation. [2]
- h) What is the significance of density of states in quantum theory? [2]
- i) What is meant by doping in semiconductors? [2]
- j) Define the Hall voltage and its relevance in semiconductor physics? [2]

PART-B**(50 Marks)****Unit-1**

- 2 a) Derive the condition for constructive and destructive interference in non - parallel boundaries thin film. [5]
- b) Discuss Brewster's law and derive the condition for polarization by reflection. [5]

(OR)

- 3 a) Describe Fraunhofer diffraction through a single slit and explain the intensity distribution. [5]
- b) What are retardation plates? Discuss the working of quarter-wave plate with applications. [5]

Unit-2

- 4 a) Briefly explain simple cubic, body centered, and face centered unit cells. [5]
b) Derive an expression for interplanar spacing in terms of Miller indices for a cubic system. [5]

(OR)

- 5 a) What is X-ray diffraction? Describe the working and applications of powder method. [5]
b) The glancing angle for first-order diffraction on (111) plane is 30° . Calculate the wavelength of X-rays if the interplanar spacing is 3.5 \AA . [5]

Unit-3

- 6 a) Explain ionic, and orientational polarizations with suitable examples [5]
b) Show that the dielectric constant is related to polarizability due to local field. [5]

(OR)

- 7 a) Explain hysteresis loop and its significance in magnetic material selection. [5]
b) Differentiate between paramagnetic and antiferromagnetic materials with examples. [5]

Unit-4

- 8 a) Derive Schrödinger's time-independent wave equation in one dimension. [5]
b) Write expressions for energy levels of a particle in an infinite potential well and explain the physical meaning of quantization. [5]

(OR)

- 9 a) State the assumptions and outline the limitations of Sommerfeld's quantum free electron theory [5]
b) Sketch and explain Fermi-Dirac distribution function at $T = 0\text{K}$ and $T > 0\text{K}$. [5]

Unit-5

- 10 a) Derive the expression for carrier concentration in intrinsic semiconductors. [5]
b) What are extrinsic semiconductors? Explain the concept with the help of energy band diagrams. [5]

(OR)

- 11 a) What is the Hall effect? Explain how it is used to find the type of semiconductor. [5]
b) Write down any two applications of the Hall effect. Calculate mobility of electrons if conductivity is $5.8 \times 10^7 \text{ S/m}$ and electron concentration is $8.5 \times 10^{28} \text{ m}^{-3}$. (Charge of electron = $1.6 \times 10^{-19} \text{ C}$) [5]
