

Code No: **R231203**

**R23**

**SET - 1**

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM**  
**I B. Tech II Semester Supplementary Examinations January-2025**  
**ENGINEERING PHYSICS**

(Common to CE, EEE, AME, MECH, ECE)

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.*

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**PART-A**

(20 Marks)

- 1 a) State and explain superposition theorem. [2]
- b) State Brewster's law and explain the concept of polarization by reflection. [2]
- c) What is a space lattice? [2]
- d) Explain briefly working mechanism of an X-ray diffractometer. [2]
- e) Differentiate between **E** and **D**. [2]
- f) Give any four properties of diamagnetic materials. [2]
- g) State the Heisenberg's uncertainty principle. [2]
- h) Write the significance of Fermi Dirac distribution function. [2]
- i) How are electron-hole pairs formed? Explain. [2]
- j) What are semiconductors? Explain their energy band diagram. [2]

**PART-B**

(50 Marks)

**Unit-1**

- 2 a) Discuss the practical applications of thin-film interference in producing colours. [5]
- b) Explain how Newton's Rings are used to determine the refractive index of a given material. [5]

(OR)

- 3 a) What is double refraction? Explain the concept with a neat ray diagram. [5]
- b) How does the slit width affect the diffraction pattern? Determine the width of the central spot in the case of Fraunhofer diffraction at a single slit. [5]

**Unit-2**

- 4 a) Explain the concept of lattice parameters and their role in defining a crystal structure. [5]
- b) What are Miller Indices? Give stepwise procedure for its determination. [5]

(OR)

- 5 a) State and derive Bragg's law for X-ray diffraction. Explain its significance in determining crystal structures. [5]
- b) Describe Laue's method for determination of crystal structure. [5]

**Unit-3**

- 6 a) Explain how polar and non-polar dielectrics are polarized. [5]
- b) What is ionic polarization? Derive expression for ionic polarizability. [5]

(OR)

- 7 a) Explain the origin of magnetic moments in magnetic materials. [5]
- b) What is meant by magnetic domain? Explain the origin of domains in ferromagnetic materials. [5]

Unit-4

- 8 a) What is de Broglie hypothesis? Discuss the concept of the dual nature of matter. [5]  
b) Analyze the quantum behavior of a particle in a one-dimensional infinite potential well. [5]

(OR)

- 9 a) In a solid, consider the energy level lying 0.01 eV below Fermi level. What was the probability of this level not being occupied by an electron. [5]  
b) What are the postulates of quantum free electron theory? Explain how this theory addressed the drawbacks of classical free electron theory. [5]

Unit-5

- 10 a) Derive an expression for carrier concentration of electron in an intrinsic semiconductor. [5]  
b) Obtain an expression for carrier concentration in an N-type semiconductor. [5]

(OR)

- 11 a) Derive Einstein's equation relating to the diffusion coefficient and mobility of charge carriers. [5]  
b) Distinction between the valence band, conduction band, and bandgap with appropriate diagrams. [5]

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