

Code No: 111AD**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****B. Tech I Year Examinations, January/February - 2024****ENGINEERING PHYSICS****(Common to CE, EEE, ME, ECE, CSE, IT, AE, MIE, AGE)****Time: 3 Hours****Max. Marks: 75**

- Note:** i) Question paper consists of Part A, Part B.
ii) Part A is compulsory, which carries 25 marks. In Part A, answer all questions.
iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

PART - A**(25 Marks)**

- 1.a) What is packing fraction? [2]
- b) How Miller Indices are useful to identify crystal planes in an FCC lattice? [3]
- c) Describe the significance of Davisson and Germer's experiment in the context of quantum mechanics. [2]
- d) What are matter waves? [3]
- e) Define electric dipole moment. [2]
- f) What is dielectric constant? [3]
- g) Explain the characteristics of a laser. [2]
- h) What is population inversion? [3]
- i) Identify the factors affecting architectural acoustics. [2]
- j) Explain Hall Effect. [3]

PART - B**(50 Marks)**

- 2.a) Given an X-ray diffraction angle (2θ) of 45° and an X-ray wavelength of 0.1 nm, use Bragg's Law to calculate the interplanar spacing in a crystal.
 - b) Describe the structure of a Sodium Chloride (NaCl) crystal. Discuss its bonding, coordination number. [5+5]
- OR**
- 3.a) Describe the Powder Method in X-ray diffraction and its advantages over the Laue Method.
 - b) Calculate the atomic packing factor for a Body-Centered Cubic (BCC) lattice, given that the atomic radius is 'r'. [5+5]
- 4.a) Explain the concept of 'Density of States' in the context of electron theory in solids and its significance in determining the electronic properties of materials.
 - b) How does the concept of Infinite Square well potential apply to quantum mechanics, and how is it extended to three dimensions? [5+5]

OR

- 5.a) Compare and contrast Bose-Einstein and Fermi-Dirac Statistics.
- b) Explain the significance of the E-K curve and the origin of energy band formation in solids. [5+5]

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- 6.a) Discuss the concept of internal fields in dielectric solids.
- b) Describe the properties of anti-ferromagnetic and ferrimagnetic materials and their applications. [5+5]

OR

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- 7.a) Compare and contrast electronic, ionic, and orientation polarizations in dielectrics.
- b) Explain the domain theory of ferromagnetism and analyze the features of a hysteresis curve. [5+5]

- 8.a) Describe the diffraction grating experiment and its applications in measuring wavelengths of light.
- b) Discuss Einstein's coefficients and their relation between them. [5+5]

OR

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- 9.a) Discuss the theory of Fraunhofer diffraction due to a single slit and its significance.
- b) Explain the concepts of acceptance angle and numerical aperture in fiber optics. [5+5]

- 10.a) Estimate carrier concentration in intrinsic semiconductors of conduction band.
- b) Describe Sabine's formula for reverberation time and its application in acoustic design. [5+5]

OR

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- 11.a) Discuss the I-V characteristics of a PN junction diode and its practical implications.
- b) Compare and contrast the synthesis of nanomaterials using sol-gel and Chemical Vapor Deposition (CVD) techniques. [5+5]

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