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School of Basic Sciences
Bachelor of Science Honours in Physics
Mid Term Examination - May 2024

Duration : 90 Minutes
Max Marks : 50

Sem IV - C1UD402T - Condensed Matter Physics

General Instructions

Answer to the specific question asked

Draw neat, labelled diagrams wherever necessary

Approved data hand books are allowed subject to verification by the Invigilator

- 1) Explain the behaviour of semiconductors at absolute zero temperature. K2 (2)
- 2) Define periodic potential. K1 (3)
- 3) Classify the crystal system with their lattice parameters in 3D crystal system. K2 (4)
- 4) Explain built-in-potential (potential barrier). What will be direction of internal electric field developed due to potential barrier in a zero biased p-n junction diode? K2 (6)
- 5) Illustrate the periodicity character of potential in a crystal. K3 (6)
- 6) Describe the powder diffraction method for X-ray diffraction. Interpret the formation of diffraction pattern on photographic plate. K3 (9)
- 7) The first order (100) reflection angle is 18° for a cubic crystal using X-rays of wavelength 1.54 \AA . Determine the distance between the (100) planes and the (111) plane of the crystal. K4 (8)
- 8) Define the Brillouin zone. Discuss the construction of first three Brillouin zones for a square lattice. Determine the reciprocal lattice vectors which define the Brillouin zones of bcc and fcc lattices. K4 (12)

OR

Investigate the role of the Meissner effect in the development and characterization of superconducting materials. Discuss how researchers utilize this phenomenon to study the properties of superconductors and to design novel materials with enhanced superconducting capabilities. K4 (12)