05-06-2026 FE SEM-I (ALL BRANCHES) C SCHEME EP-I QP CODE: 20012216

Time: 2 Hours **Total Marks: 60**

N.B.:

(1) Question No. 1 is compulsory.
(2) Attempt any three questions from Q. 2 to Q. 6
(3) Assume suitable data wherever required.
(4) Figures to the right indicate marks.

Q. 1 Attempt any five **[15]**

a) Define Superconductivity, Critical Temperature and Critical Magnetic Field
b) Draw the following with reference to cubic unit cell (002); (101); (111)
c) Explain Construction of LCD
d) State de Broglie's hypothesis. Deduce an expression for the wavelength of de Broglie's matter waves
e) What are the properties of matter waves?
F) What is the significance of wave function?
g) The resistivity of cu is 1.72×10^{-8} ohm-m.calculate the mobility of electron in Cu.Given that the number of electrons per unit volume is $10.41 \times 10^{28}/m3$

Q. 2

a) Derive the condition for maxima and minima due to interference of light in wedge shaped film. [7]
b) Explain the concept of Fermi level in an Extrinsic Semiconductor.
A Cu strip 2 cm wide and 1 mm thick is placed in a magnetic field of 1.5 Wb/m^2. If a current of 200 A is set up in the strip, calculate the Hall voltage that appears across the strip. (Given: $R_H = 6 \times 10^{-7}$ m^3/C) [8]

Q. 3

a) Explain phase velocity & group velocity of a matter waves. Derive the one dimensional time dependent Schrodinger wave equation for matter waves. [8]
b) What is photovoltaic effect? Explain the principle, working & applications of solar cell. [7]

Q. 4

a) Explain Heisenberg's uncertainty principle with example & give its physical significance [5]
b) In Newton's ring experiment the diameter of 4^{th} and 12^{th} dark rings are 040cm and 0.70cm.find the diameter of 20^{th} dark ring in reflected light. [5]
c) Calculate electron and hole concentration in intrinsic silicon at room temperature if its electrical conductivity is 4×10^{-4} mho/m. (mobility of electron=0.14 m^2 /V-s & mobility of hole=0.04 m^2 /V-s) [5]

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Q. 5

a) What are Type I and Type II superconductors [5]

b) Find the energy of neutron in electron volt(ev) whose de Brodlie wavelength is 1A0.Mass of Neutron=1.674 x 10-27, plancks constant(h)= 6.62 x10-34 j-s. [5]

c) Derive an expression for the interplanar spacing for (hkl) planes in a cubic crystal. [5]

Q. 6

a) What are liquid crystals? Explain various phases of liquid crystals. [5]

b) Define and explain anti-reflection films. [5]

c) State and explain Meissner effect? [5]

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