FE/SEM-I/ AII BRANCHES / DEC-23
C-SCHEME-19
13/111/2025

Q.P. code:- 95305

[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) Draw the following planes
     (101), (121),(113)
  b) In Newton's Rings reflected light of wavelength 5×10^{-3} cm. The diameter of the 10th dark ring is 0.5 cm. Calculate radius of curvature R.
  c) What is de Broglie wavelength of an electron which has been accelerated from rest through a p.d. of 100 V?
  d) Explain construction of Liquid Crystal Display.
  e) Explain Meissner effect with application.
  f) What is the significance of wave function?
  g) Explain why an excessively thin film appears black in the reflected light.

Q. 2
  a) Explain rhe concept of holes as majority carriers in the p-type semiconductors.
     Calculate electron and hole concentration in intrinsic silicon at room temperature if its electrical conductivity i: 4×10^{-4} $(\Omega\text{-m})^{-1}$
     Take $\mu_e = 0.14$ m^2/v-s and $\mu_h = 0.04$ m^2/ v-s   [3+5]
  b) Derive the condition for maxima and minima due to interference of light-reflected from a thin film of uniform thickness.   [7]

Q. 3
  a) Derive one dimensional time dependent Schrodinger equation for matter waves.   [8]
  b) Explain the Principle, construction and working of LED.   [7]

Q. 4
  a) Explain analysis of crystal structure using Bragg's X-ray spectrometer.   [5]
  b) Wahat are the properties of matter waves   [5]

  c) Find the tickness of the soap film which appear yellow ($\lambda = 5896$ A^0) in reflection when it is illuminated by white light at an angle of 45^0.
     (Given R.I. of the film is 1.33)
                                                                                             [5]

Q. 5
  a) What are high T_c superconductors?
     Explain their Principle characteristics, advantages, disadvantages and applications.   [5]
  b) Derive an expression for the interplanar spacing for (hkl) planes in a cubic crystal.   [5]
  c) In a semiconductor with $R_H = 145$ cc/c having width of 2 cm and thickness 0.2 cm with a magnetic induction o 2T along the smaller dimension, a current of 150 mA is passing. Calculate current density and Hall voltage
  d) Q. 6   [5]
  a) What is mesomorphic state of matter? Explain with a neat diagram the cholesteric state
  b) Distinguish between type-I and type-II supercapacitors   [5]
  c) White light is incident at an angle of 45^0 on a soap film 4×10^{-5} cm thick. Find the wavelength of light in visibl spectrum which will be absent in the reflected light.   [5]
     ($\mu = 1.2$)

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