Code No: R19BS1204 **R19** SET - 1

I B. Tech II Semester Supplementary Examinations, November - 2021

APPLIED PHYSICS

(Com. to EEE, ECE, CSE, EIE, IT)

Time: 3 hours Max. Marks: 75

Answer any five Questions one Question from Each Unit
All Questions Carry Equal Marks

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UNIT- I

1. a) What is a thin film? Derive the conditions for constructive and destructive interference for the reflected system in a thin film of uniform thickness. (8M)

   b) White light is incident on a transparent film of refractive index 1.33 and thickness 1.6μm at an angle of 45^0. When the reflected light is examined, a dark band corresponding to 500nm is seen. Find the order of the band. (3M)

   c) State and explain the superposition theorem. (4M)

Or

2. a) Define the resolving power of a microscope. Deduce an expression for it. (8M)

   b) A microscope is used to resolve to self-luminous objects separated by a distance of 4.0×10^{-5} cm. If the wavelength of light is 5461Å. Find the angle subtended at the eye by these objects when viewed at a distance of distinct vision 25cm. (3M)

   c) Draw the intensity distribution curves in the case of diffraction at the single and double slit. (4M)

UNIT- II

3. a) Exemplify the experimental verification of matter waves by Davisson and Germer. (10M)

   b) Electrons are accelerated through 344V and are reflected from a crystal. The first reflection maximum occurs when the glancing angle is 60^0. Determine the spacing of the crystal. Given $h=6.62\times10^{-34}$J-s, $q=1.6\times10^{-19}$C, and $m_e=9.1\times10^{-31}$kg. (5M)

Or

4. a) Obtain Schrödinger time-dependent wave equation and hence differentiate between the time-dependent and independent Schrodinger wave equations. (10M)

   b) Explain briefly the basis of a normalized function. (5M)

UNIT- III

5. Derive an expression for the density of states and based on that calculate the carrier concentration in metals. (15M)

Or

6. a) Write the Fermi-Dirac distribution function. Explain how the Fermi function varies with temperature. (10M)

   b) Evaluate the Fermi function for energy KT above the Fermi energy. (5M)
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UNIT- IV

7. a) What are N-type semiconductors? Derive an expression for carrier concentration in an N-type semiconductor with an energy band diagram. (10M)

   b) An intrinsic Ge at room temperature with a carrier concentration of $2.4 \times 10^{9}\ m^{-3}$ is doped with one Sb atom in 10^{6} Ge atoms. What would be the concentration of holes if the Ge atom concentration is $4 \times 10^{28}\ m^{-3}$? (5M)

Or

8. a) Derive the expression for the Hall coefficient. How is the Hall coefficient related to the mobility of charge carriers? (10M)

   b) The Hall coefficient (R_H) of a semiconductor is $3.22 \times 10^{-4}\ m^{3}\ C^{-1}$. Its resistivity is $8.50 \times 10^{-3}\ \Omega$-$m$. Calculate the mobility and carrier concentration of the carriers. (5M)

UNIT- V

9. a) Explain the different types of polarization mechanisms in dielectric materials. (8M)

   b) Explain applications of dielectric materials. (7M)

Or

10. a) Explain how the magnetic materials are classified from the atomic point of view. (8M)

    b) What are the differences between hard and soft magnetic materials? (7M)