INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)

B.TECH II Semester End Examinations (Regular) AUGUST- 2021
Regulation:UG20
APPLIED PHYSICS

Time: 3 Hours   (CSE|IT|CSE(AIML)|CSE(CS)|CSE(DS)|CSIT)   **Max Marks: 70**

Answer all questions in Modules I and II
Answer ONE out of two questions from Modules III, IV and V
(NOTE: Provision is given to answer TWO questions from among one of the Modules III / IV / V)
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

MODULE – I

1. (a) Describe an experimental technique which is direct proof that particles like electrons are associated waves when they are in motion. **[7M]**

   (b) Find the De Broglie wavelength of an electron whose speed is 2.0×10^8 m/sec. **[7M]**

MODULE – II

2. (a) Discuss the motion of an electron in a periodic potential. Explain how the above theory leads to the concept of band structure of solids. **[7M]**

   (b) The intrinsic carrier density at room temperature in Ge is 2.37×10^{19} /m^3. If the electron and hole mobilities are 0.38 and 0.18 m^2/V sec respectively. Calculate the resistivity. **[7M]**

MODULE – III

3. (a) Explain in detail direct and indirect band gap semiconductors with energy band diagrams and examples. **[7M]**

   (b) Calculate the forward bias current of a Si diode when forward bias voltage of 0.4V is applied, the reverse saturation current is 1.17×10^{-9}A and the thermal voltage is 25.2mV. **[7M]**

4. (a) Explain the construction and working of solar cell with suitable diagrams. Draw the V-I characteristics of solar cell. **[7M]**

   (b) Consider a silicon diode with η=1.2. Find the change in voltage if the current changes from 0.1mA to 10mA. **[7M]**

MODULE – IV

5. (a) Give a schematic sketch of different types of polarization and explain in detail. **[7M]**

   (b) Consider a parallel plate capacitor having an area 6.45×10^{-4} m^2 and a plate separation of 2×10^{-3} m across which a potential of 10 V is applied. If a material having dielectric constant of 6.0 is positioned with in the region between the plates. Compute
   i) The capacitance ii) Magnitude of the charge stored on each plate. **[7M]**

6. (a) List the differences between diamagnetic, paramagnetic, and ferromagnetic materials. **[7M]**

(b) The magnetic flux density within a bar of some material is 0.63 Tesla at an H field of 5×10^5 A/m. Compute i) The magnetic susceptibility ii) Magnetic permeability. **[7M]**

MODULE – V

7. (a) Explain the principle of operation of optical fiber. Draw a schematic layout of a step index optical fiber. **[7M]**

   (b) A step index fiber has a core of refractive index 1.5. If the numerical aperture of the fiber is 0.26, calculate the refractive index of the cladding material. **[7M]**

8. (a) Explain the construction and working of a ruby laser system with suitable energy level diagram. **[7M]**

   (b) In a material, transition occurs between a metastable state and an energy level of 0.25 eV. The wavelength of the radiation emitted is 1100nm. Calculate the energy of the metastable state. **[7M]**

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