Hall Ticket No | | | | | | | | | | | Question Paper Code:AHSC09

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal-500043, Hyderabad

B.Tech II SEMESTER END EXAMINATIONS (REGULAR) - SEPTEMBER 2022
Regulation:UG20

APPLIED PHYSICS

(Common to CSE | CSE(AI&ML) | CSE(CS) | CSE(DS) | CSIT | IT)

Time: 3 Hours **Max Marks: 70**

Answer ALL questions in Module I and II
Answer ONE out of two questions in Modules III, IV and V
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

MODULE – I

1. (a) Write Schrodinger time independent equations. Apply time independent equation for a particle confined one dimensional infinite potential well of width L and solve it to obtain allowed energy of nth state. [BL: Understand| CO: 1|Marks: 7]

   (b) Calculate the de Broglie wavelength of an electron moving with 3/5 c.(mass of electron=$9.11X10^{-31}$ kg, velocity of light $c = 3 \times 10^8$ m/s)

   [BL: Apply| CO: 1|Marks: 7]

MODULE – II

2. (a) Distinguish intrinsic and extrinsic semiconductors. Obtain an expression for the carrier concentration of intrinsic semiconductors. [BL: Understand| CO: 2|Marks: 7]

   (b) Determine the Fermi level energy E_F, in a silicon semiconductor at 300 K. band gap energy, $E_g = 1.12eV, m_e^* = (m_h^*)/2$. [BL: Apply| CO: 2|Marks: 7]

MODULE – III

3. (a) Explain the operation of a Zener diode in forward and reverse bias conditions.

   [BL: Understand| CO: 3|Marks: 7]

   (b) Current flowing in a p-n junction 0.2 micro amp at room temperature when a large reverse bias voltage is applied. Calculate the current when a forward bias voltage 0.1 V is applied.

   [BL: Apply| CO: 3|Marks: 7]

4. (a) Illustrate the construction and working mechanism of solar cells with suitable diagrams.

   [BL: Understand| CO: 3|Marks: 7]

   (b) A particular green LED emits a light of wavelength 5490 $\dot{A}$. Calculate the band gap of the semiconductor material used in eV. (Planck's constant = $6.63 \times 10^{-34} Js$, Velocity of light, $c = 3 \times 10^8 ms^{-1}$ and charge of electron =$1.6 \times 10^{-19} C$) [BL: Understand| CO: 3|Marks: 7]

MODULE – IV

5. (a) Write short notes on polarizability and susceptibility. Determine an expression for the internal field in the case of solids. [BL: Understand| CO: 4|Marks: 7]

   (b) An elemental solid containing 2×10^{28} atoms m^{-3} shows electronic polarizability of $2 \times 10^{-40} Fm^2$. Assuming a Lorentz force field to be operative, calculate the dielectric constant of the material. [BL: Apply| CO: 4|Marks: 7]

6. (a) What is meant by magnetization in a magnetic material? Discuss the classification of magnetic materials on the basis of magnetic moment. [BL: Understand| CO: 4|Marks: 7]

   (b) A magnetic field of $2000 Am^{-1}$ is applied to a material which has a susceptibility of 1000. Calculate i) Relative permeability of the material ii) Magnetization iii) Flux density. [BL: Apply| CO: 4|Marks: 7]

MODULE – V

7. (a) Illustrate the construction and working of a He-Ne laser with appropriate diagrams. [BL: Understand| CO: 5|Marks: 7]

   (b) A LASER beam has a power of 50 mW and wavelength 5000 Angstrom at 300K. Calculate the number of photons emitted per minute. [BL: Apply| CO: 5|Marks: 7]

8. (a) Distinguish between step- index and graded index fibres. Obtain an mathematical expression of numerical aperture with appropriate ray diagram. [BL: Understand| CO: 6|Marks: 7]

   (b) Calculate the numerical aperture and hence the acceptance angle for an optical fiber kept in an air medium whose core and cladding have a refractive index of 1.45 and 1.40 respectively. [BL: Apply| CO: 6|Marks: 7]

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