



Vidyavardhini's College of Engineering & Technology, Vasai (W)

First Year Engineering

Academic Year: 2024-25

Subject: BSC102/AP

QUESTION BANK - (IAT-II)

Course Outcome (CO)-4: Electrodynamics

Theory Questions:

1. What is divergence and curl of a vector function? Give their significance.
2. Derive Maxwell's first equation in differential form for static electric field produced by charge enclosed within a closed surface.
3. Derive Maxwell's 3rd equation in differential form, which describes how the electric field circulates around the time-varying magnetic field.
4. Obtain Ampere's circuital law for static magnetic field in integral and differential form.

Numericals:

1. Find the divergence of a field for $\vec{A} = x^2y \mathbf{i} - 3xyz^2 \mathbf{j} + 2xy \mathbf{k}$ at (1,1,1)
2. Find the curl of a Vector field for $\vec{E} = 4x \mathbf{i} + 2y \mathbf{j} + 3z \mathbf{k}$ at (1,0,1)
3. Find the gradient of a scalar field $\phi = x^2y + 4xy + xy^2z^2$
4. Calculate $\vec{\nabla} B$ for $B = x^2 + y^2 + z^2$ at a point (1, -2, 4)

Course Outcome (CO)-5: Quantum Physics

Theory Questions:

1. Explain de-Broglie's hypothesis and derive expression for its wavelength.
2. What is Heisenberg's Uncertainty Principle? Prove that electron cannot exist in the nucleus using H.U.P.
3. Derive Schrodinger Time dependent Wave Equation.
4. Derive Schrodinger Time Independent Wave Equation.

Numericals:

1. An electron has a speed of 400 m/sec with uncertainty of 0.01%. Find the accuracy in its position.
2. An electron has a momentum 5.4×10^{-26} kg-m/sec with an accuracy of 0.05%. Find the minimum uncertainty in the location of the electron.
3. Find the energy of the neutron in unit of electron volt. Where De- Broglie wavelength is 1 \AA
Mass of neutron = 1.674×10^{-27} Kg and Planck's constant = 6.63×10^{-34} Js

Course Outcome (CO)-6: Basics of Semiconductor Physics

Theory Questions:

1. What is the difference between direct and indirect bandgap semiconductors?
2. Explain Fermi-Dirac distribution function.
3. Explain conductivity, mobility, drift velocity and establish relation among them.

Numericals:

1. Calculate the conductivity of a Ge specimen if the donor impurity added to Ge is 1.2×10^{23} atoms/m³. Given mobility of electron is 3800 cm²/V-sec.
2. If fermi level in K is 2.1eV, calculate the energy for which the probability of occupancy at 300°K is 0.99?
3. Find the resistivity of intrinsic germanium at 300K. Given density of carriers is 2.5×10^{19} atoms/m³, mobility of electron is 0.39 m²/V-sec and mobility of hole is 0.19 m²/V-sec.

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