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[3861]-159

F. E. (Semester - II) Examination - 2010

APPLIED SCIENCE - II

(PHYSICS)

(2008 Pattern)

Time : 2 Hours]

[Max. Marks : 50

Instructions :

- (1) All questions are compulsory.
- (2) Black figures to the right indicate full marks.
- (3) Neat diagrams must be drawn wherever necessary.
- (4) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
- (5) Assume suitable data, if necessary.

Constants : $h = 6.63 \times 10^{-34}$ J-S

$C = 3 \times 10^8$ m/sec.

$m_e = 9.1 \times 10^{-31}$ kg

$m_p = 1.67 \times 10^{-27}$ kg

$e = 1.6 \times 10^{-19}$ C

- Q.1) (A) What do you understand by the Wave Function of a Moving Particle ? What does square of the Wave Function signify ? [06]
- (B) Explain Group Velocity and Phase Velocity. Derive expression for Group Velocity with which a Wave Group Travels. [07]
- (C) At what Kinetic Energy an Electron will have a Wavelength of 5000\AA ? [04]

OR

- Q.2)** (A) Obtain three dimensional time independent Schrödinger's Wave Equation. [07]
- (B) State and explain Heisenberg's Uncertainty Principle. Illustrate this principle by diffraction of a beam of electrons by a narrow slit. [06]
- (C) Compute energy difference between the ground state and first excited state for an electron in a one-dimensional rigid box of length 10^{-8} cm. [04]
- Q.3)** (A) Explain construction and working principle of Ruby LASER. [07]
- (B) Explain what is the significance of critical temperature, critical magnetic field and critical current density for Superconductors. [06]
- (C) Elaborate on any two applications of Superconductors. [04]

OR

- Q.4)** (A) Explain how BCS Theory explains Superconductivity ? [07]
- (B) Describe propagation mechanism of light wave in Optical Fibres. [06]
- (C) Explain the terms : Optical Pumping, Population Inversion [04]
- Q.5)** (A) Explain Chemical Vapour Deposition Method for Manufacturing Nano Particles. [06]
- (B) What is Hall Effect ? Derive relation for Hall Voltage and Hall Coefficient. [06]
- (C) Write down an expression for the probability of occupancy of a particular energy state of an electron in an intrinsic semiconductor. Represent it graphically at 0°k and at room temperature. [04]

OR

OR

- Q.6 (A) Describe any two properties of Nano Particles. [06]
- (B) Derive an expression for conductivity in an Intrinsic and Extrinsic Semiconductor. [06]
- (C) Explain applications of Nano Particles in the field of Medicine and Electronics. [04]
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