Total No. of Questions : 6] [Total No. of Printed Pages : 3

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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 5000A° ? **[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 semi-conductor. Represent it graphically at 0^{o}k and at room temperature. **[04]**

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]**
