Total No. of Questions—**6**] [Total No. of Printed Pages—**3**

Seat No.	

[4756]-23

F.E. (Second Semester) EXAMINATION, 2015

APPLIED SCIENCE—II

PHYSICS

(2008 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Answer Q. No. **1** *or* Q. No. **2,** Q. No. **3** *or* Q. No. **4,** Q. No. **5** *or* Q. No. **6**.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

(*iv*) Use of logarithmic tables, Slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*v*) Assume suitable data, if necessary.

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

$c = 3 \times 10^{8}$ m/s

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

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

1. (*a*) State and explain properties of matter wave. Show that the wavelength associated, with an electron, accelerated by a potential difference of V volts, is given by $h/\sqrt{2meV}$. [7]

P.T.O.

(*b*) State and explain Heisenberg's uncertainty principle. Illustrate it by an experiment on electron diffraction at a single slit. [6]

(*c*) De Broglie wavelength of electrons in a monoenergetic beam is 7.2×10^{-11} m. Calculate the momentum and energy of electrons in the beam in eV. [4]

Or

2. (*a*) Derive the Schrödinger's time independent wave equation. [7]

(*b*) What is a wave group ? Show that the group velocity of a matter wave is equal to the particle velocity. [6]

(*c*) Compute energy difference between the ground state and first excited state for an electron in 1-dimensional rigid box of length 10^{-8} cm. [6]

3. (*a*) Explain the construction and working of Ruby laser with neat labelled diagram. [7]

(*b*) What is superconductivity ? Explain Meissner's effect. [6]

(*c*) Explain any *two* applications of the superconductors. [4]

Or

4. (*a*) Explain with neat diagram principle, construction and working of He-Ne laser. [7]

(*b*) Explain type-I and type-II superconductor. [6]

(*c*) Explain : [4]

(*i*) Population Inversion

(*ii*) Pumping Mechanism.

5. (*a*) Explain with neat diagram any *one* method of synthesis of nano-particles. [6]

(*b*) State and explain Hall effect. Obtain an expression for Hall voltage. [6]

(*c*) Calculate the mobility of charge carriers in doped silicon whose conductivity is 100 per Ω-m and the Hall coefficient is 3.6×10^{-4} m^3/C. [4]

Or

6. (*a*) Explain any *two* properties of nano-materials. [6]

(*b*) Using the Fermi-Dirac probability distribution function, derive the position of Fermi level in the intrinsic semiconductor. [6]

(*c*) Discuss applications of Nanotechnology in the field of Medical and Electronics. [4]