Total No. of Questions—**6**] [Total No. of Printed Pages—**2**

Seat No.	

[4956]-9

F.E. (Semester II) EXAMINATION, 2016
APPLIED SCIENCE-II (Physics)
(2008 COURSE)

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

N.B. **:—** (*i*) Answer any *three* questions (Q. Nos. 1 *or* 2, Q. Nos. 3, *or* 4, Q. Nos. 5 *or* 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.s

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

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

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

1. (*a*) Explain group velocity and phase velocity. Derive an expression for group velocity with which a wave group travels. [7]

(*b*) Derive Schrodinger's time independent wave equation. [6]

(*c*) An electron is accelerated through potential difference of 10 kV. Calculate the de-Broglie wavelength and momentum of the electron. [4]

Or

2. (*a*) Starting from Schrodinger's time independent equation, find energy and wave function of the particle in a rigid box. Show necesssary waveforms. [7]

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(*b*) State Heisenberg's uncertainty principle and illustrate it by electron diffraction at a single slit. [6]

(*c*) Calculate first two energy eigen values of an electron trapped in an infinite potential well of length 1 Å. [4]

3. (*a*) Draw a neat diagram and explain the construction and working of He-Ne laser. [7]

(*b*) Distinguish between Type I and Type II superconductors. [6]

(*c*) Explain the preocess of spontaneous emission and stimulated emission. [4]

Or

4. (*a*) What is Superconductivity ? State and explain the following : [7]

(*i*) Meissner effect

(*ii*) Critical magnetic effect

(*iii*) Persistent current.

(*b*) Explain the operation of Ruby laser with a neat labelled diagram. [6]

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

5. (*a*) Explain classification of solids into conductors, semiconductors and insulators on the basis of energy band theory. [6]

(*b*) Explain synthesis of metal nanoparticles by colloidal route. [6]

(*c*) Calculate the number of acceptors to be added to a Germanium sample to obtain resistivity of 10 Ω cm. [4]
(Given : μ = 1700 cm^2 / Volt-sec)

Or

6. (*a*) Explain any *two* properties of Nanoparticles. [6]

(*b*) What is Hall effect ? Derive relation for Hall voltage and Hall coefficient. [6]

(*c*) Discuss any *two* applications of Nanotechnology. [4]