



F.E. (Semester – II) Examination, 2011
APPLIED SCIENCE – II (Physics)
(2008 Pattern)

Time : 2 Hours

Max. Marks : 50

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

Constants : 1) $h = 6.63 \times 10^{-34} \text{ J.s}$

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

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

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

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

1. a) State and explain properties of matter waves. 6
- b) Deduce Schrodinger's time independent wave equation. 7
- c) Calculate de-Broglie wavelength of 10 keV protons in A.U. 4

OR

2. a) State and explain Heisenberg's uncertainty principle. Illustrate the same by "Electron diffraction at a single slit". 6
- b) Deduce Schrodinger's time dependent wave equation. 7
- c) Calculate the first energy eigen value of electron in eV, trapped in rigid box of length 1 A.U. 4

P.T.O.



3. a) Explain construction and working of He-Ne laser. 7
- b) State and explain Meissner effect. Hence show that susceptibility is negative in superconducting state. 6
- c) Explain the terms :
- i) Optical pumping.
- ii) Population inversion. 4

OR

4. a) Explain BCS theory of superconductivity. 6
- b) Explain construction and working of Ruby Laser. 7
- c) Write a note on Josephson effect. 4
5. a) Explain classification of solids into conductors, semiconductors and insulators on the basis of energy band theory. 6
- b) Explain optical and electrical properties of nanoparticles. 6
- c) Draw energy band diagrams for P-N junction diode in forward biased and reverse biased conditions. 4

OR

6. a) Explain synthesis of metal nanoparticles by colloidal route. 6
- b) Obtain an expression for conductivity of semiconductors. 6
- c) Calculate the mobility of charge carriers in a doped silicon of which conductivity is 100 mho/m and the Hall coefficient is $3.6 \times 10^{-4} \text{ m}^3/\text{c}$. 4