May- June- 2011

[3961] – 109

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, slilde rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*5) Assume suitable data, **if necessary**.*

Constants : *1) $h = 6.63\times10^{-34}$ J.s*
2) $m_e = 9.1\times10^{-31}$ kg
3) $c = 3\times10^{8}$ m/s
4) $e = 1.6\times10^{-19}$C
5) $m_p = 1.67\times10^{-27}$kg

1. a) State and explain properties of matter waves. **6**

   b) Deduce Schroedinger'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 Schroedinger'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 3.6×10^{-4} m^3/c. **4**
