



[4656] – 23

Seat No.	
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F. E. (Semester – II) Examination, 2014
APPLIED SCIENCE – II (Physics)
(Old) (2008 Course)

Time : 2 Hours

Max. Marks : 50

- Instructions :** 1) Answer **any three** questions (Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6)
2) Figures to the **right** indicate **full** marks.
3) Neat diagrams must be drawn **wherever** necessary.
4) **Use of electronic calculator is allowed.**
5) Assume suitable data **if** necessary.

- Constants :** 1) Mass of electron (m_e) = 9.1×10^{-31} kg.
2) Charge on electron (e) = 1.9×10^{-19} C
3) Mass of neutron (m_n) = 1.675×10^{-27} kg.
4) Planck's Constant (h) = 6.63×10^{-34} J.s
5) Velocity of light in vacuum (c) = 3×10^8 m/s.

1. a) State and explain Heisenberg's Uncertainty Principle. Illustrate this principle with an experiment on diffraction of electrons. **7**
b) Derive Schrodinger's time independent equation. **6**
c) Calculate the de-Broglie wavelength associated with 1 Mev neutron. **4**
OR
2. a) Derive equation of energy and wave function when a free particle is trapped in an infinite potential well. **7**
b) Explain the concept of group velocity. Show that group velocity is equal to the velocity of the particle. **6**
c) Calculate energy level difference between first two excited state of a neutron trapped in infinite potential well of width 10^{-15} m. **4**
3. a) With the help of energy level diagram explain construction and working of He-Ne laser. **6**
b) What is Critical Magnetic Field ? Explain Type-I and Type-II superconductors. **6**
c) Explain for laser (a) Stimulate emission of radiation (b) Pumping. **4**
OR
4. a) What is superconductivity ? Explain BCS theory of superconductivity. **6**
b) With the help of energy level diagram explain construction and working of Ruby laser. **6**
c) Explain for superconductor (a) Transition temperature (b) Persistent current. **4**

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5. a) What is band gap energy ? Explain classification of solids into conductors, semiconductors and insulators on the basis of band theory of solids. 7
- b) What are the different methods for synthesis of nanoparticles ? Explain any one method in details. 6
- c) A strip of copper of thickness 1.5×10^{-4} m is placed in a magnetic field of 1 T perpendicular to the plane of the strip and a current of 10 A is setup in the strip. What Hall voltage would appear across the width of the strip if concentration of charge carries in copper is 8.5×10^{28} electrons/m³. 4

OR

6. a) Explain the construction and working of solar cell. Explain its IV characteristics. 7
- b) Explain any two properties of nanoparticles. 6
- c) A germanium sample has 4.56×10^{22} atoms/cc and a donor impurity in the ratio of one part per 10^{10} is added to create an N type semiconductor. If the mobility of charge carries is $3900 \text{ cm}^2/\text{V-s}$, find the conductivity of silicon. 4

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