

F.E. (Semester - II) Examination, 2014 **APPLIED SCIENCE – II (Physics)** (Old) (2008 Course)

Time : 2 Hours

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.
- 1) Mass of electron (m_e) = 9.1×10^{-31} kg. Constants :
 - 2) Charge on electron (e) = 1.9×10^{-19} C
 - 3) Mass of neutron =(m_n) = 1.675 × 10⁻²⁷kg.
 - 4) Plank'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. OR	4
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) b)	With the help of energy level diagram explain construction and working of He-Ne laser. What is Critical Magnetic Field ? Explain Type–I and Type–II superconductors.	6 6
	c)	Explain for laser (a) Stimulate emission of radiation (b) Pumping. OR	4
4.	a) b) c)	What is superconductivity ? Explain BCS theory of superconductivity. With the help of energy level diagram explain construction and working of Ruby laser. Explain for superconductor (a) Transition temperature (b) Persistent current.	6 6 4

[4656] – 23

Max. Marks: 50

Seat No.

[4656] – 23

5.	a)	What is band gap energy ? Explain classification of solids into conductors, semiconductorsand insulators on the basis of band theory of solids.7	7
	b)	What are the different methods for synthesis of nanoparticles ? Explain any one method in details.	3
	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 0.5×10^{28} electrone (m ³)	
		8.5×10^{20} electrons/m ³ . OR	ł
6.	a)	Explain the construction and working of solar cell. Explain its IV characteristics.	7
	b)	Explain any two properties of nanoparticles.	5
	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 cm ² / V–s, find the conductivity of silicon.	1

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