M.Sc. (Final) DEGREE EXAMINATION, DECEMBER – 2015

(Second Year)

PHYSICS

Paper – V : Electromagnetic Theory and Modern Optics

Time : 3 Hours   Maximum Marks: 80

Answer any five questions

All questions carry equal marks

1)   a)   Derive Fresnel equation.

      b)   Discuss the amplitude of electromagnetic waves on reflection and refraction at the boundary of a dielectric interface.

2)   a)   From the wave vector surfaces, distinguish between uniaxial crystals and biaxial crystals.

      b)   Discuss Lienard – Wiechert potentials of a moving point charge.

3)   a)   What is population inversion?

      b)   Write various pumping schemes to achieve population inversion.

4)   a)   What is meant by coherence?

      b)   Explain the principle and working of He-Ne laser.

5)   a)   Explain the principle and working of a hologram with neat sketch.

      b)   Differentiate Fresnel and Fourier transform holography.

6) a) Write a brief note on fibre optic materials.

   b) Obtain the expression for numerical aperture of a optical fibre.

7) a) Explain signal distortion in optical fibers and various methods to minimize it.

   b) Distinguish between step index fiber and graded index fiber structures.

8) a) What is total internal reflection?

   b) Give the experimental details of producing optical fibres.

9) Answer any two of the following:

   a) Threshold condition.

   b) Retarded potentials.

   c) Convolution integral.

   d) Applications of lasers.

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(DPHY 22)

Time : 3 Hours   Maximum Marks: 80

Answer any Five questions

All questions carry equal marks

1)   a)   Explain the terms dipole moment and quadruple moment.

       b)   Explain the theory of deuteron.

2)   a)   Obtain an expression for Weizsacker semi empirical mass formula and explain various terms.

       b)   How this formula explain the behavior of an isobaric family.

3)   a)   With suitable examples explain direct nuclear reaction.

       b)   Derive Briet – Wigner formula and explain its significance.

4)   a)   Explain various interactions among elementary particles.

       b)   What are the conservation laws associated with elementary particles.

5)   a)   Explain the theory of ESR spectroscopy.

       b)   What are the applications of ESR?

6)   a)   Derive Bloch equations in NMR.

       b)   Briefly explain the relaxation mechanisms for nuclei with spin $\frac{1}{2}$.

7) a) What are the various shapes of molecules and explain them in detail.

   b) Calculate the energy levels of a diatomic molecule as a rigid rotator.

8) a) Derive an expression for vibrational energy of a diatomic molecule in case of simple harmonic oscillator.

   b) What are PQR branches.

9) Write a note on any TWO of the following.

   a) Liquid drop model.

   b) Selection rules in β – transitions.

   c) Nuclear Quadruple Resonance.

   d) Instrumentation for IR spectroscopy.

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M.Sc.(Final)DEGREE EXAMINATION, DECEMBER – 2015

Second Year

PHYSICS

Paper – VII : Solid State Physics

Time : 3 Hours   Maximum Marks: 80

Answer any Five questions

All questions carry equal marks

1) a)   Write about point groups and space groups.

   b)   Discuss the importance of symmetry operations in crystals.

2) a)   What is Bragg's law. Explain its importance in determining the crystal structure

   b)   Explain the Lauei's interpretation of X-ray diffraction by crystas.

3) a)   Define cohesive energy. Distinguish between primary and secondary bonds.
          Write the Properties ionic and covalent bonds.

   b)   Obtain the dispersion relation of monoatomic one dimension infinite lattice.

4) a)   Derive the expression for normal modes in diatomic one dimension lattice.

   b)   Discuss the Restrahlen effect in ionic crystals.

5) a)   State and explain Dulong and Petit's law.

   b)   Discuss the Einstein theory of heat capacity and mention its failures.

6) a) Discuss the motion of electron in one dimension lattice (Kronig- Penney model)

   b) Write about anharmonic effects.

7) a) Derive the expression for the carrier concentration in conduction band
      of intrinsic Semiconductor.

   b) Discuss the variation of Fermi level in extrinsic semiconductor with temperature.

8) a) State and explain Quantum Hall effect.

   b) Discuss the formation of p-n junction and give some examples for p-n junction
      devices.

9) Write note on any two of the following.

   a) Different crystal systems

   b) General theory of harmonic approximation

   c) Phonons properties

   d) Magneto resistance

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M.Sc. (Final) DEGREE EXAMINATION, DECEMBER – 2015

Second Year

PHYSICS

Paper – VIII : Solid State Physics-II

Time : 3 Hours   Maximum Marks: 80

<u>Answer any Five questions</u>

<u>All questions carry equal marks</u>

1)   What are various polarizabilities? Discuss the classical theory of electronic polarizability and derive dispersion relation .

2)   What is piezoelectricity? Describe any two applications of piezoelectric effect in detail.

3)   Distinguish between edge and screw dislocations. Discuss the stress field   around screw dislocation.

4)   With suitable examples distinguish between diamagnetism and paramagnetism. Derive an expression for diamagnetic susceptibility using quantum C theory.

5)   Draw a typical B-H curve of a ferromagnetic material and explain different stages of   magnetization process based on the domain theory.

6)   Discuss the Neel model of ferrimagnetism and explain the properties and applications of ferrites.

7)   Explain the concept of energy gap in superconductor. Discuss how this concept is used to explain the fundamental properties of superconductors.

8)   Discuss the Ginzburg- Landau theory of superconductivity.

9) Write a note on any TWO of the following.

    a)   Experimental determination of dielectric constant

    b)   Point defects

    c)   Weiss theory of ferromagnetism

    d)   BCS theory of superconductors

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