M.Sc. (Second) DEGREE EXAMINATION, DEC. – 2016
Second Year
PHYSICS
Electromagnetic Theory and Modern Optics

Time : 3 Hours   **Maximum Marks : 70**

SECTION – A
Answer any five of the following

Q1) Find the boundary conditions prevailing at the interface of two dielectrics, assuming no free charge to be present.

Q2) a)   Explain the polarization on reflections and by refraction.

b)   Write a note on total internal reflection.

Q3) a)   Give a brief account on applications of lasers.

b)   Explain the amplification in a laser medium

Q4) a)   Explain the attainment of population inversion in two – level lasers.

b)   What is optical resonator? Explain

Q5) a)   Write a brief note on different broadening mechanisms.

b)   Describe the principle and working of ruby laser

Q6) a)   What is hologram? Explain the principles and characteristics of holograms.

b)   Write the applications of holography.

Q7) a) Obtain the wave guide equations for step index fibers.

b) Distinguish between step index and graded index fibers

Q8) a) Explain the signal degradation and attenuation in optical fibers

b) Explain mode coupling and fiber cabling.

Q9) Write notes on any two of the following :

a) Absorption of FM waves

b) Einstein co-efficients

c) Source Coherence and stability in holography

d) Mode theory of circular wave guides

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(DPHY22)

M.Sc. (Second) DEGREE EXAMINATION, DEC. – 2016
Second Year
PHYSICS
Nuclear Physics, Molecular & Resonance Spectrosopy

Time : 3 Hours   **Maximum Marks : 70**

Answer any five questions.
All questions carry equal marks.

Q1) a)   Explain nuclear stability and nuclear magnetic moment.

b)   Explain the charge independence and spin dependence of nuclear forces.

Q2) a)   Explain p – p and n – p scattering.

b)   Briefly explain the shell model of the nucleus.

Q3) a)   What is Q – equation? Explain its significance.

b)   Explain the Threshold energy and cross sections for nuclear reactions.

Q4) a)   Explain the Gamow's theory of α - decay.

b)   Explain the interaction between elementary particles.

Q5) a)   Explain the spin – lattice and spin – spin relaxation mechanisms.

b)   Briefly explain the working of NMR.

Q6) a)   What is electron spin resonance? Explain the fine structure of unpaired electrons.

b)   Explain the working of NQR spectrometer with neat block diagram.

Q7) a) Explain the diatomic linear symmetric tap and asymmetric tap molecules.

b) Explain the rotational spectra of Rigid rotator.

Q8) a) Explain the vibrational energy of diatomic molecules.

b) Explain the principle and applications of IR spectroscopy.

Q9) Write a note on any Two of the following :

a) Yukawa potential

b) Fermi's theory of f - decay

c) Working of ESR

d) PQR branches

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(DPHY23)

M.Sc. (Second) DEGREE EXAMINATION, DEC. – 2016

Second Year

PHYSICS

Solid State Physics - I

Time : 3 Hours   **Maximum Marks : 70**

Answer any Five questions

Q1) a) Define unit cell and explain different symmetry operations in crystals.

     b) Explain the determination of crystal structure with reciprocal lattice.

Q2) a) State and explain Bragg's law in X – ray diffraction.

     b) Explain the determination of lattice constants.

Q3) a) Distinguish between primary and secondary bonds and explain cohesive energy.

     b) Explain the lattice vibrations in one dimensional diatomic chain.

Q4) a) Explain the general theory of Harmonic approximation.

     b) Explain the quantization of lattice vibrations.

Q5) a) Give the assumptions of classical theory of lattice heat capacity.

     b) Explain anharmonic effects in solids.

Q6) Discuss the Kronig – penny model for the motion of an electron in a periodic potential.

Q7) a) Discuss the nearly free electron theory of metals.

b)   Obtain the expression for density of electrons in an intrinsic semiconductor.

Q8) a)   State and explain Hall effect.

b)   Explain Thermoelectric effect.

Q9) Write notes on any Two of the following :

a) Construction of reciprocal lattice

b) Inelastic neutron scattering.

c) Quantum theory of heat capacity.

d) Magneto resistance.

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`(DPHY24)`

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M.Sc. (Second) DEGREE EXAMINATION, DEC. – 2016
Second Year
PHYSICS
Solid State Physics - II

Time : 3 Hours   Maximum Marks : 70

Answer any Five questions

Q1) Explain what is meant by polarization in dielectrics? Arrive at the relation between dielectric constant and atomic polarizability.

Q2) Explain the chief characteristics and its classification of ferroelectric materials.

Q3) Briefly explain the imperfections in crystals and discuss the role of dislocations in crystal growth.

Q4) Explain the quantum theory of diamagnetism and paramagnetism of materials.

Q5) Describe the weiss molecular field theory of ferromagnetism and derive the curie – weiss law.

Q6) Discuss the domain structure in ferromagnetic materials and give Neel's theory of antiferro magnetism.

Q7) Briefly outline the BCS theory of super conductivity and explain the evidence for the existence of energy gap.

Q8) Describe the Landan theory of superconductivity and explain high temperature super conductors.

Q9) Write a note on any two of the following

a) Piezoelectricity and Electrostriction

b) Grain boundaries

c) GMR – CMR materials

d) Isotope effect in super conductors.

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