

(DPHY21)

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M.Sc. (Second) DEGREE EXAMINATION, MAY – 2017

PHYSICS

Second Year

Electromagnetic Theory and Modern Optics

Time : 3 Hours

Maximum Marks : 70

Answer any Five questions

All question carry equal marks.

- Q1)** a) Explain the achievement of polarization by reflection and refraction.
b) Obtain an expression for transmission coefficients.
- Q2)** a) Write a note on total internal reflection.
b) Explain the absorption of EM waves propagated obliquely to conducting medium.
- Q3)** a) Explain different properties of Laser light.
b) Obtain relation between Einstein coefficients.
- Q4)** a) Write a note on Laser pumping.
b) Explain line and Doppler broadening mechanisms.
- Q5)** a) Discuss the attainment of population inversion.
b) Describe the working of CO₂ laser
- Q6)** a) Write a note on source coherences and stability in hologram.
b) Explain the basic theory of holography.
- Q7)** a) Write a note on fiber types, rays and modes.
b) Explain ray optics representation in step index fibers.
- Q8)** a) What is numerical aperture? Explain signal degradation in graded index fibers.
b) Explain the mechanical properties of fibers.
- Q9)** Write any Two of the following :
- a) Total internal reflection in optical fiber.
b) Change of phase on reflection in EM theory of light.
c) Absorption and emission process in Lasers.
d) Recording and resolution of hologram.

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M.Sc. (Second) DEGREE EXAMINATION, MAY – 2017

Second Year

Physics

Nuclear, Physics, Molecular & Resonance Spectroscopy

Time : 3 Hours

Maximum Marks : 70

Answer any Five of the following

All question carry equal marks.

- Q1)** a) Explain mass defect and binding of nucleus.
b) Define nuclear force and explain its characteristics.
- Q2)** a) Explain Proton – proton and neutron – proton scattering.
b) Briefly explain the Meson theory of Nuclear forces.
- Q3)** a) Obtain semi – empirical mass formula.
b) Obtain Q – equation and explain its significance.
- Q4)** a) Explain Fermi’s theory of β – decay.
b) Write a note on nuclear isomerism.
- Q5)** a) Explain spin – lattice and spin – spin relaxation mechanism.
b) Briefly explain the working of NMR spectrometer.
- Q6)** a) Explain the characteristics of A and g values in ESR.
b) Describe briefly the working of NQR spectrometer.
- Q7)** a) Explain different types of molecules.
b) Explain the rotational spectra of Rigid rotation.
- Q8)** a) Obtain an expression for vibrational energy of diatomic molecules.
b) Briefly explain IR spectroscopy.
- Q9)** Write a note on any Two of the following.
a) Magic numbers
b) Conservation laws among the elementary particles.
c) ESR spectrometer
d) PQR branches



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M.Sc. (Second) DEGREE EXAMINATION, MAY – 2017

PHYSICS

Second Year

Solid State Physics - I

Time : 3 Hours

Maximum Marks : 70

Answer any Five of the following

All question carry equal marks.

- Q1)** a) What are symmetry operations? Explain the meaning of a 'n' fold rotation axis and n – fold screw axis.
b) Explain different point groups and space groups in a crystal lattice.
- Q2)** a) Explain the Laue's interpretation of x – ray diffraction in crystals.
b) Explain the determination of lattice constants.
- Q3)** a) Define atomic cohesion and explain the cohesive energy.
b) Explain the ball and spring model of a harmonic crystal.
- Q4)** a) Explain the normal modes of a one dimensional diatomic chain.
b) Explain the phonon dispersion by inelastic Neutron scattering.
- Q5)** a) Give the assumptions of classical theory of lattice specific heat.
b) Explain quantum theory of heat capacity.
- Q6)** Discuss in detail the Kronig – penny model for the motion of electron in a periodic potential.
- Q7)** a) Explain the nearly free electron model.
b) Obtain an expression for carrier density in extrinsic semiconductor.
- Q8)** a) State and explain Hall effect.
b) Explain thermoelectric effect.
- Q9)** Write a notes on any Two of the following :
a) Bragg's law
b) Quantization of Lattice vibrations
c) Anharmonic effects.
d) General features of extrinsic semiconductors.



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M.Sc. (Second) DEGREE EXAMINATION, MAY – 2017

Second Year

PHYSICS

Solid State Physics II

Time : 3 Hours

Maximum Marks : 70

Answer any Five questions

All questions carry equal marks

- Q1)** Explain what is meant by polarization in solid dielectric. Arrive at the relation between the dielectric constant and atomic polarizability.
- Q2)** Give the classification of representative ferroelectric materials and explain the theory of the ferroelectric displacive transitions.
- Q3)** What is meant by point defects in crystal lattice? Explain different types of point defects with suitable examples.
- Q4)** Distinguish between paramagnetism and diamagnetism and explain the quantum theory of magnetic susceptibility.
- Q5)** Explain the Heisenberg's exchange interaction in ferromagnetism and discuss the ferro magnetic domains.
- Q6)** Give an account of Neel's theory of antiferromagnetism and explain spin waves.
- Q7)** Define super conductivity and explain what is energy gap in super conductors. Discuss the observation and dependence of preparation on energy gap in superconductors.
- Q8)** Explain the BCS Theory of super conductors and discuss the important predictors of the BCS theory.
- Q9)** Write a note on Two of the following :
- Ferroelectric domains
 - Adiabatic demagnetization
 - GMR – CMR materials
 - High Temperature super conductors.

