

(DPHY21)

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M.Sc. (Second) DEGREE EXAMINATION, MAY – 2018

Second Year

PHYSICS

Electromagnetic Theory and Modern Optics

Time : 3 Hours

Maximum Marks : 70

Answer any Five of the following

All questions carry equal marks

- Q1)** a) Explain the boundary conditions at the plane of separation between two dielectric media.
- b) Explain how polarization can be achieved by reflection and refraction.
- Q2)** a) Write a note on total internal reflection.
- b) Explain metallic reflection at oblique incidence.
- Q3)** a) Explain the properties of Laser light
- b) Obtain the relation between the coherence of the field and the size of the source.
- Q4)** a) Explain the attainment of population inversion in four level Laser system.
- b) Explain the working of He – Ne Laser
- Q5)** a) Explain film resolution, source coherence and stability in holography.
- b) Explain different types of holograms.
- Q6)** a) Explain total internal reflection in Fibre optics.
- b) Explain mode theory of circular wave guides.
- Q7)** a) Obtain wave guide equations for step index fibers.
- b) Discuss signal degradation in optical fibers.

- Q8)** a) Explain the pulse broadening in graded index fibers.
- b) Discuss the mechanical properties of fiber and fiber cabling.

Q9) Write any two of the following :

- a) Change of phase on reflection.
- b) CO₂ Laser
- c) Hologram recording materials.
- d) Step index fiber structures.



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M.Sc. DEGREE EXAMINATION, MAY – 2018

Second Year

PHYSICS

Nuclear Physics, Molecular & Resonance Spectroscopy

Time : 3 Hours

Maximum Marks : 70

Answer any Five of the following

All questions carry equal marks

- Q1)** a) Explain dipole moment and quadrupole moment of the nucleus.
b) Explain proton – proton and Neutron – Proton scattering mechanisms.
- Q2)** a) Obtain semi empirical mass formula.
b) Explain Bohr – Wheeler theory.
- Q3)** a) Explain different nuclear reactors with examples.
b) Obtain Q – equation and explain its importance.
- Q4)** a) Discuss the Gamow's theory of α decay
b) Explain the properties of elementary particles.
- Q5)** a) Explain the basic principle and relaxation mechanisms in NMR.
b) Explain briefly the working of ESR spectrometer.
- Q6)** a) Explain the fine structure and hyperfine structure of unpaired electrons in ESR.
b) Draw the block diagram of NQR spectro - meter and explain.
- Q7)** a) Explain rotational spectra of rigid rotator.
b) Discuss the energy levels of Non rigid rotator.

Q8) a) Explain how diatomic molecule on a simple harmonic oscillation.

b) Explain the fundamentals of IR spectroscopy.

Q9) Write a notes on any two of the following :

a) Ground state of deuteron

b) Interaction between the elementary particles.

c) NMR spectrometer.

d) PQR branches



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M.Sc. (Second) DEGREE EXAMINATION, MAY – 2018

Second Year

PHYSICS

Solid State Physics I

Time : 3 Hours

Maximum Marks : 70

Answer any Five of the following

All questions carry equal marks

- Q1)** a) Write a note on crystal point groups and space groups.
b) Discuss the Lane interpretation of x – ray diffraction by crystals.
- Q2)** a) Obtain the relation between a , b , c and a^* , b^* and c^* .
b) Discuss the measurement of diffraction patterns of crystals.
- Q3)** a) What are primary and secondary bonds? Explain with examples.
b) Discuss the Normal modes of one dimensional mono atomic chain.
- Q4)** a) Explain the general theory of Harmonic approximation.
b) Explain the measurement of phonon dispersion by inelastic neutron scattering.
- Q5)** a) Obtain an expression for heat capacity.
b) Explain an harmonic effects in solids.
- Q6)** Discuss indetail the motion of an electron in a periodic potential using lenning penry model.
- Q7)** a) Explain nearly free electron model.
b) Distinguish between insulators, semiconductors and metals based on band theory of solids.
- Q8)** a) Obtain an expression for carrier density in intrinsic semiconductor.
b) State and explain Hall effect.

Q9) Write notes on any two of the following :

- a) Bragg's law in x – ray diffraction.
- b) Quantization of lattice vibrations.
- c) Wave mechanical interpretation of energy bands.
- d) Magneto resistance.



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M.Sc. (Second) DEGREE EXAMINATION, MAY – 2018

Second Year

PHYSICS

Solid State Physics - II

Time : 3 Hours

Maximum Marks : 70

Answer any Five questions

All questions carry equal marks

- Q1)** Explain the Local field in solid dielectrics and write a note on dielectric losses.
- Q2)** Define antiferroelectricity, piezoelectricity and electrostriction and write down the applications of piezoelectric crystals.
- Q3)** Describe with suitable examples point defects in crystals.
- Q4)** Discuss in detail the quantum theory of magnetic susceptibility.
- Q5)** Explain Heissenberg model in the ferromagnetism and write a note on ferromagnetic domains.
- Q6)** Explain the determination of magnetically ordered structures and write a note on GMR – CMR materials.
- Q7)** Define superconductivity and explain the BCS theory of superconductivity.
- Q8)** Explain the Ginzburg – Landan theory of superconduction and give a note on high temperature superconductors.
- Q9)** Write any two of the following :
- Polarization mechanisms.
 - Vanvlek paramagnetism.
 - Weiss theory of ferromagnetism.
 - Isotope effect in superconductors.

