

Code No. 16513/CORE

FACULTY OF SCIENCE**M. Sc. III – Semester Examination, March / April 2021****Subject : Physics
Paper – I : Modern Optics****Time : 2 Hours****Max. Marks: 80****PART – A****Answer any five questions.****(5 x 7 = 35 Marks)**

- 1 Describe any four properties of a laser beam
- 2 Mention the various pumping mechanisms in lasers with examples
- 3 Draw the energy level diagram of a carbondioxide molecule and show the laser transitions in a carbon dioxide laser.
- 4 Differentiate between temporal coherence and spatial coherence
- 5 Write a note on Fourier transform hologram
- 6 Write an expression for the Fresnel Diffraction integral and explain each parameter
- 7 Explain how a lens performs a fourier transform on an incident light beam
- 8 What is meant by spatial frequency filtering? Explain one application

PART – B**Answer any three questions.****(3 x 15 = 45 Marks)**

- 9 Explain the processes that occur when monochromatic light interacts with a two level atomic system. Deduce Einstein coefficients.
- 10 Obtain an expression for population inversion in a three level laser system.
- 11 Explain the construction and working of a Ruby laser, its characteristics and applications.
- 12 With an energy level diagram, explain how an excimer laser is produced. Give examples and applications of excimer lasers.
- 13 What is a Hologram? Explain in detail, the steps of recording and reconstruction of the object in holography.
- 14 Explain how an Off-axis hologram removes the disadvantages of a Gabor hologram.
- 15 Deduce the thickness function for a thin converging lens under paraxial approximation
- 16 (a) Explain various types of lenses and What are the fourier transforming properties of lenses.
(b) Explain Phase Matching.

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FACULTY OF SCIENCE
M.Sc. III-Semester (CBCS) Examination, March 2021

Sub: Physics
Paper – II : Advanced Solid State Physics

Time: 2 Hours

Max.Marks:80

PART – A

Answer any five questions.

(5x7=35 Marks)

- ✓1 Distinguish between Fermi surface and Brillouin zone.
- ✓2 Define extended, periodic and reduced zone schemes diagrammatically.
- 3 Explain terms: (i) dielectric polarization (ii) dipole relaxation
- 4 List the properties of ferroelectric materials.
- 5 Distinguish between ferromagnetism and anti-ferromagnetism.
- 6 List the application of ferrites.
- ✓7 Explain Meissner effect.
- ✓8 Differentiate between type-I and type-II superconductors.

PART – B

Answer any three questions.

(3x15=45 Marks)

- 9 Explain de Hass-Van Alphen effect. Why this method is considered to be a powerful to study Fermi surfaces?
- ✓10 Explain how Harrison's method is used to construct Fermi surfaces, using extend zone method.
- 11 Explain electronic, ionic and orientation polarisability. Explain the ferroelectric hysteresis nature in detail.
- 12 Obtain Clausen-Mosotti relation and discuss the concept of local field.
- 13 Give an account of Weiss theory of ferromagnetism and describe paramagnetic cooling method.
- 14 Explain Bloch wall and discuss Neel's theory of anti-ferromagnetism in detail.
- ✓15 Discus London's phenomenological approach made in superconductors. Obtain a relation for London penetration depth.
- ✓16 Explain BCS theory and write the applications of superconductors.
