



Seat No. _____

HB-003-0496003

B. Sc. / M. Sc. (Applied Physics) (Sem. VI)
(CBCS) Examination

April – 2023

Experimental Techniques in Physics : Paper-XXII
(New Course)

Faculty Code : 003

Subject Code : 0496003

Time : $2\frac{1}{2}$ Hours / Total Marks : 70

Instructions :

- (1) All questions are compulsory.
- (2) Numbers in the right indicate marks.

- 1 (A) Write answers : 4
- (1) Define : Interference.
 - (2) What is multiple beam interferometry ?
 - (3) Explain the relationship between phase difference and path difference.
 - (4) What is Etalon ?
- (B) Write answers (any One) : 2
- (1) When the movable mirror of a M.I. is moved by 0.059 mm, a shift of 200 fringes is observed. What is the wavelength of light used ?
 - (2) The initial and final readings of a M.I. Screw is 10.7347 mm and 10.6903 mm as 150 fringes pass. Calculate the wavelength of light used ?
- (C) Write answers (Any One) : 3
- (1) What is Lummer - Gehrke plate ? Explain in detail.
 - (2) Explain in detail : principle for the formation of Newton's ring and derive the equation for darker and brighter ring.

- (D) Write answers (Any One) : 5
- (1) Describe construction and working of Michelson's Interferometer (M.I) with its important applications. Why G2 plate is known as compensating plate in Michelson Interferometer ?
 - (2) Deduce an expression for the intensity distribution in fringes for Fabry Perot Interferometer. Discuss the sharpness of fringes.
- 2 (A) Write answers : 4
- (1) Define : Polarisation.
 - (2) What is meant by double refraction ?
 - (3) What is negative and positive crystal ? Give the examples.
 - (4) Status Malus Law.
- (B) Write answers (any One) : 2
- (1) Give Huygen's theory of double refraction in uniaxial crystal.
 - (2) What is Rochon prism ?
- (C) Write answers (Any One) : 3
- (1) Explain the construction, principle and use of quarter wave plate.
 - (2) Write short note : Nicole prism.
- (D) Write answers (Any One) : 5
- (1) Explain theory of production of elliptically and circularly polarized light.
 - (2) Write a detailed note on Babinet's compensator and explain how it is better than the retardation plates.
- 3 (A) Write answers : 4
- (1) Draw a well labelled diagram for Stark effect for transverse view.
 - (2) What is space quantization ?
 - (3) Explain in short : Splitting of sodium D lines transverse to the applied magnetic field with necessary figures.
 - (4) What is total angular quantum number j ?

- (B) Write answers (any One) : 2
- (1) What is Pauli's exclusion principle ?
 - (2) Why Bohr's atom model failed ?
- (C) Write answers (Any One) : 3
- (1) Explain Vector Atom Model in detail.
 - (2) Discuss the selection rules in conjunction with the vector atom model.
- (D) Write answers (Any One) : 5
- (1) Write a note on Zeeman Effect with Lorentz explanation on the basis of classical electron theory.
 - (2) Describe Stark's effect with necessary figures.
- 4 (A) Write answers : 4
- (1) What is Raman effect ?
 - (2) Explain the splitting of sodium D lines longitudinal to the applied magnetic field with necessary figures.
 - (3) Draw a well labelled diagram of the Raman setup in pre-laser era.
 - (4) What is π and σ component of sodium D_1 lines ?
- (B) Write answers (any One) : 2
- (1) What is zero-point energy ?
 - (2) Explain spectrum of Harmonic Oscillator in short.
- (C) Write answers (Any One) : 3
- (1) What are the applications of the Raman Effect in physics.
 - (2) Explain the theory of pure rotational spectra of a diatomic molecule treating as a rigid rotator.
- (D) Write answers (Any One) : 5
- (1) How the Non-rigid rotator energy level expression explains the observed microwave spectrum ? Draw the diagram and show the spectrum.
 - (2) Explain in detail : In what way the IR and Raman spectra are helpful in determining the structure of a molecule.

- 5 (A) Write answers : 4
- (1) What is j-j coupling ?
 - (2) What is resolution of an interferometer ?
 - (3) List the various methods to polarization of light.
 - (4) When Paschen Back effect occurs ?
- (B) Write answers (any One) : 2
- (1) Explain j-s coupling.
 - (2) Explain Brewster's law.
- (C) Write answers (Any One) : 3
- (1) What is magnetic orbital quantum number m_l ?
 - (2) Explain the construction, principle and use of half wave plate.
- (D) Write answers (Any One) : 5
- (1) Explain the intensity rules for atomic spectra.
 - (2) Write the different tests of analysis of polarized light in detail.
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