



**DN-003-0496003**

Seat No. \_\_\_\_\_

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

**March – 2022**

**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 margin indicate marks

**1 Attempt Any Seven short questions : 14**

- (1) Define interference. Give the examples of interference of division of wave front and division of amplitude.
- (2) The initial and final readings of a MI screw is 10.7347mm and 10.6903mm as 150 fringes pass. Calculate the wavelength of light used?
- (3) Calculate the path difference when a phase difference  $\pi$  between two interfering beams.
- (4) State and Explain Brewster's law.
- (5) Describe how a Nicol prism can be used as an analyser.
- (6) What is the selection rule for L?
- (7) Explain the splitting of sodium D lines transverse and longitudinal to the applied magnetic field with necessary figures.
- (8) Explain: Space quantization.
- (9) Explain in short: An orbital quantum number.
- (10) How many fundamental modes of vibration a linear molecule having N atoms can have?

- 2 (A) Write answers of Any **Two** : 10
- (1) Explain principle for the formation of Newton's ring and derive the equation for darker and brighter ring.
  - (2) Describe construction and working of Michelson's Interferometer (M.I) with its important applications.
  - (3) Discuss Fabry Perot Interferometer in detail.
  - (4) Write a note on Lummer - Gehrcke plate.
- (B) Write answer of Any **One** : 4
- (1) What is Etalon? Write the steps for standardisation of the meter.
  - (2) Discuss the resolving power of Fabry- Perot interferometer.
- 3 (A) Write answers of Any **Two** : 10
- (1) Discuss Nicol prism in detail.
  - (2) Explain the construction, principle and use of (i) quarter wave plate and (ii) half wave plate.
  - (3) What is double refraction? Explain Huygen's theory of double refraction in uniaxial crystal.
  - (4) Write a detailed note on Babinet's compensator.
- (B) Write answer of Any **One** : 4
- (1) Discuss the theory of production of linearly, elliptically and circularly polarised light. Explain how they can be distinguished from one another.
  - (2) Write different steps for analysis of polarised light.
- 4 (A) Write answers of Any **Two** : 10
- (1) Discuss normal Zeeman effect on the basis of classical electron theory.
  - (2) Derive an expression for frequency shift according to Debye's explanation of the Normal Zeeman effect.
  - (3) Write a detailed note: Vector atom model.
  - (4) Discuss Paschen-Back effect in detail.

- (B) Write answer of Any **One** : 4
- (1) Explain Anomalous Zeeman Effect on the basis of classical electron theory.
  - (2) Discuss Stark effect with necessary diagram.
- 5 (A) Write answers of Any **Two** : 10
- (1) Explain the theory of pure rotational spectra of a diatomic molecule treating it as a rigid rotator. Derive the expression for energies.
  - (2) In what way the IR and Raman spectra are helpful in determining the structure of a molecule? Discuss in detail with suitable example.
  - (3) Prove that the frequency of a hot band is approximately equal to that of the fundamental band.
  - (4) Explain the spectrum of Harmonic Oscillator. What is zero-point energy?
- (B) Write answer of Any **One** : 4
- (1) How the non-rigid rotator energy level expression explains the observed microwave spectrum? Draw the necessary diagram.
  - (2) What is the "Rule of mutual exclusion" in Raman spectrum? Explain with examples.
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