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**NEPWT—297—2024**

**FACULTY OF SCIENCE**

**M.Sc. (First Year) (Second Semester) EXAMINATION**

**NOVEMBER/DECEMBER, 2024**

**PHYSICS**

**SPHYE-451**

(Atomic and Molecular Physics)

**(Wednesday, 18-12-2024)**

**Time : 10.00 a.m. to 1.00 p.m.**

*Time—3 Hours*

*Maximum Marks—60*

*N.B. :—* (i) All questions carry equal marks.

(ii) Q. No. 1 is compulsory.

(iii) Solve any *three* of the remaining five questions (Q. 2 to Q. 6).

(iv) Figures to the right indicate full marks.

1. Solve the following questions (each question 5 marks) : 15

(a) Explain Lande  $g$  factor in detail.

(b) Microwave spectrometer.

(c) Describe electronic spectra of diatomic molecule.

2. (a) Explain co-relation between Zeeman and Paschen Back effect. 8

(b) Explain L-S and J-J coupling. 7

P.T.O.

3. (a) Explain pure rotational spectra of symmetric top molecule. 8
- (b) Explain the effect of isotopic substitution on rotational spectra of diatomic molecule. 7
4. (a) Give the complete theory of vibrational-rotational spectra of diatomic molecule. 8
- (b) Explain Frank-Condon principle. 7
5. (a) Describe experimental set up to observe Raman spectra in detail. 8
- (b) Describe structure determination from Raman and IR spectroscopy. 7
6. Write short notes on (each question 5 marks) : 15
- (a) Molecular polarizability
- (b) Pauli's exclusion principle.
- (c) IR spectrometer.