

SECTION—B

- V. Discuss theory and methodology of Nuclear Magnetic Resonance Spectroscopy. 8½
- VI. Write notes on the following :
- (a) Coupling between several nuclei in NMR
- (b) Double Resonance. 5,3½
- VII. Predict the ESR spectrum resulting from the coupling of an unpaired electron with (i) Two equivalent protons; and (ii) Two non-equivalent protons. 4,4½
- VIII. Write notes on the following :
- (a) McConnell's relation and its significance
- (b) Application of ESR in biological structure determination. 4,4½

SECTION—C

- IX. (i) Describe regions of electromagnetic spectrum.
- (ii) Discuss the significance of 'g' factor in ESR.
- (iii) Why is TMS used as reference compound in NMR technique ?
- (iv) Write classical equation of vibration for linear molecules and explain the terms involved.
- (v) What do you understand by simple harmonic oscillator ?
- (vi) Explain the term 'Overtones'.
- (vii) Discuss Fortrat parabola.
- (viii) Describe the significance of coupling constant.
- (ix) What do you mean by Kramer's degeneracy ? Explain.
- (x) Calculate number of hyperfine lines in (i) $\text{CH}_3\dot{\text{C}}\text{H}_2$ and (ii) $\dot{\text{C}}\text{H}_3$ radicals.
- (xi) Explain "Raman Effect". 11×2

Roll No.

Total No. of Pages : 2

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FUNDAMENTALS OF SPECTROSCOPY—331

Semester—III

Time Allowed : Three Hours]

[Maximum Marks : 55

Note :- The candidates are required to attempt *two* questions each from Section A and B. Section C will be compulsory.

SECTION—A

- I. (a) State and explain induced quantum transition. Derive an equation for the rate of transition.
- (b) What are prolate and oblate symmetric top molecules ? Discuss the rotational spectra of symmetric top molecules. 4,4
- II. (a) Describe the vibrational spectra arising from a diatomic molecule, assuming that vibrations are anharmonic.
- (b) The fundamental vibrational frequency of HCl molecule is 2885 cm^{-1} . Calculate the force constant of a molecule. 5,3
- III. (a) Write a note on quantum theory of Raman effect.
- (b) What is meant by molecular polarizability ? Give its significance in the appearance of Raman lines. 5,3
- IV. Discuss the vibrational coarse structure of electronic spectra of a diatomic molecule. How Franck Cordon principle explain the intensity of vibrational coarse structure ? 8