Roll No. ....
1000 -/-/30/40

DS-208

February 2019
M. Sc. Ist Semester Examination

CHEMISTRY
Paper IV : Group Theory and Spectroscopy – I (MCH-404)

Time 3 Hours]

[Max. Marks : Regular 85 / Private 100
[Min. Marks : Regular 28 / Private 33

Note : This question paper is meant for all Regular and Private students. Answer all five questions. All questions carry equal marks. The blind candidates will be given 60 minutes extra time.

1. What do you understand by Great Orthogonality Theorem ? How is it applied for the construction of C_{2v} Character Table ?

OR

Write notes on the following :
   (a) Schoenflies Symbols.
   (b) Symmetry Elements and Operations.

2. (a) How Microwave Spectroscopy is useful to calculate moment of inertia and bond length of molecules ?
   (b) Explain the effect of isotopic substitution on the transitional frequencies of rotational spectrum.

OR

   (a) Explain Stark effect with respect to Microwave Spectroscopy.
   (b) Write an essay on the applications of Microwave Spectroscopy.

3. Derive an expression for the energy of Simple Harmonic Oscillator. Also, show that energy levels are equally spaced and vibrational energy is not zero at absolute zero.

OR

Write notes on the following :
   (a) Group frequencies and their significance.
   (b) Morse Potential Energy Diagram.
   (c) Overtones, hot bands and combination of bands.

4. What is Raman Effect ? Explain and compare Classical and Quantum Theories of Raman Effect.

OR

What do you understand by Mutual Exclusion Principle ? Explain Resonance Raman Spectroscopy (RRS).

5. Explain briefly :
   (a) Spectra of Transitional Metal Complexes.
   (b) Franck-Condon Principle.

OR

Explain the principle of ESCA and mention some of its applications.