TM142100A **Reg. No……...……..**
Name :……..

M.SC DEGREE (CSS) EXAMINATION, APRIL 2015
SECOND SEMESTER – CORE COURSE (CHEMISTRY)
CHE2MS –MOLECULAR SPECTROSCOPY

Time: Three Hours **Maximum Weight: 30**

PART A

I. Answer any *TEN* questions.
Each question carries a weightage of *1*

1. Distinguish a fundamental band from a hot band in an IR spectrum.
2. Outline the importance of stark effect studies in microwave spectroscopy.
3. What is a first order spectrum?
4. What are spherical top molecules? Give examples.
5. Why anti -Stokes lines are less intense than Stokes lines?
6. ESR spectrum is usually recorded in first derivative mode. Why?
7. Write Morse function.
8. Draw a typical Mossbauer spectrum
9. What is the term symbol for nitrogen molecule?
10. Give any two applications of laser.
11. Define chemical shift.
12. What are the advantages of FTIR technique?
13. Write McConnell equation and explain the terms.

(1x10=10)

PART B

II. Answer any *FIVE* questions by attempting not more than *THREE* questions from each bunch.
Each question carries a weightage of *2*.

Bunch 1 (Short Essay Type)

14. Write a note on spin –spin interaction in NMR spectrum.
15. Predict the number of lines in ESR spectrum of the following radicals
    (a) ($\dot{C}H3$) (b) $(SO_3)_2N\overline{O}$ (c) Naphthalene
16. Write a note on Isomer shift in Mossbauer Spectroscopy.
17. What is pre-dissociation? How would you account for it?

Bunch 2 (Problem Type)

18. The first line in the rotational spectrum of CO has a frequency of 3.8424$\underline{cm^{-1.}}$ Calculate the rotational constant and CO bond length in CO.(C-12 g/ mole, O-15.994g/ mole)
19. The Raman line associated with a vibrational mode which is both Raman and IR active is found at 4600 A^0 when excited by a light of wavelength 4358 A^o .Calculate the wave length of the corresponding IR band.
20. An NMR signal for a compound is found to be 180 Hz downward from TMS peak using a spectrometer operating at 60 MHz.Calculate its chemical shift in ppm.
21. Calculate J max for a rigid diatomic molecule for which at 300K, the rotational constant is 1.566 cm^{-1}.

(2x5=10)

PART C

III. Answer any *TWO* questions. Each question carries a weightage of *5*

22. What are the factors which influence the width and intensity of spectral lines?
23. Explain the Classical and Quantum theory of Raman Effect.
24. Discuss any three methods used for the simplification of second order NMR Spectra.
25. Write a note on the following
    (a) Karplus Relationship
    (b) Frank-Condon Principle.

(5x2=10)