M.SC.(Physics) Third Semester (OLD)

MSc23104 - Paper-VI (Optional) Atomic and Molecular Physics (Spectroscopy)-I

P. Pages : 2 **GUG/W/18/2304**

Time : Three Hours * 1 7 9 8 * Max. Marks : 80

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1. Either

a) What is chemical shift? Explain the Importance of chemical shift in NMR analysis. **8**

b) Explain spin lattice relaxation and spin-spin interaction in NMR. **8**

OR

e) Explain Mossbauer effect of γ-ray in terms of energy momentum and Einstein model. **8**

f) Explain the basic principle of interaction of spin and applied magnetic field. **8**

2. Either

a) Explain L.S. and J.J. Coupling in two valence electron system. **8**

b) What is Zeeman effect? Explain normal and anomalous Zeeman effect. **8**

OR

e) What are Einstein's A and B coefficients. Derive them. **8**

f) Explain the construction and working of ruby laser. **4**

g) Explain in details optical pumping. **4**

3. Either

a) What is Raman Effect? Give its characteristics and experimental set up. Explain Raman effect on the basis of quantum theory. **8**

b) Derive an expression for vibrational energy in diatomic molecules. **4**

c) Discuss molecular polarizability. **4**

OR

e) Explain rotational energy and Frequency of diatomic molecules. **8**

f) Explain Intensity alteration in Raman spectra of diatomic molecules. **4**

g) Explain Hund's rule. **4**

4. Either

a) Explain electronic spectra of diatomic molecules. **8**

b) Discuss Born appenheimer approximation. **8**

OR

e) Explain Franck Condon principle. **8**

f) Explain the terms with examples. **8**

i) Selection rule.

ii) Dissociation.

iii) Pre-dissociation.

iv) Dissociation energy.

5. Answer all the followings.

a) Explain fine spectrum of hydrogen atom. **4**

b) Discuss the Electron Spin Resonance (ESR) **4**

c) Explain the term Raman shift. **4**

d) Explain the general treatment of molecular orbitals. **4**

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