

M.Sc.(Physics) (CBCS Pattern) Semester - III
**PSCPHYT12-1 / PSCPHYT12 : Foundation Course F1.1 - Fundamentals of
Spectroscopy Paper-XII**

P. Pages : 2

Time : Three Hours



GUG/S/23/11304

Max. Marks : 80

Either:

1. a) Derive an expression for Lande's splitting factor (g) and explain anomalous Zeeman effect. **8**
- b) Explain how atomic states are represented by L-S and J-J coupling schemes using vector diagrams. **8**

OR

- e) With the help of Schrodinger wave equation, discuss the atomic energy levels of hydrogen atom. **8**
- f) Describe Stern-Gerlach experiment. Show how it verifies the principle features of vector atom model. **8**

Either:

2. a) Explain Fourier transform infrared spectroscopy. **8**
- b) Outline the effect of isotopic substitution on the rotational spectra of molecules. **8**

OR

- e) Discuss Born Oppenheimer approximation. **8**
- f) Discuss the salient features of vibrational rotational spectra. **8**

Either:

3. a) Discuss the effect of polarizability of the molecule on the Raman spectra. **8**
- b) What is Raman effect? Discuss the main features of vibrational and rotational Raman spectrum of a diatomic molecule. **8**

OR

- e) How are Raman spectra studied in the laboratory. **8**
- f) Discuss the pure rotational Raman spectra. **8**

Either:

4. a) Discuss pre-dissociation energy. **8**
b) State and explain Frank-Condon principle. **8**

OR

- e) Discuss the rotational fine structure of electronic vibrational transitions. **8**
f) Discuss the phenomenon of fluorescence and phosphorescence. **8**
5. Answer **all** the followings:
- a) Explain Paschen-Back effect **4**
b) What are the advantages of using FTIR spectrophotometer over conventional IR spectrophotometer. **4**
c) A substance shows Raman line at 4567 \AA when exciting line 4358 \AA is used. Discuss the positions of Stoke's and Antistoke's line for the same substance when exciting line 4047 \AA is used. **4**
d) Discuss the formation of PQR branches. **4**
