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DEPARTMENT OF SCIENCES

3rd semester M Sc Physics-end sem examination

PHY 701- Atomic and Molecular Physics

Max Marks : 50

Answer any **FIVE** of the following questions.

1. a) Explain Zeeman effect with necessary theory.

b) The spin-orbit effect splits the $3P \rightarrow 3S$ transition in sodium into two lines, 589.0 nm corresponding to $3P_{3/2} \rightarrow 3S_{1/2}$ and 589.6 nm corresponding to $3P_{1/2} \rightarrow 3S_{1/2}$. Use the data to calculate the effective magnetic field experienced by the outer electron of the sodium. Given : Bohr magneton = 9.27 x 10^{-24} J/T. (6+4) marks

2. a) Describe the quantum mechanical treatment of radiative transition of an electron.

b) Writ a note on selection rules for electronic transition. A hydrogen atom is in the 4p state. To what state or states can it go by radiating a photon in an allowed transition? (6+4) marks

3. a) Discus briefly the factors governing the intensity of rotational spectral lines.

b) Discuss the effect of rotation on the vibration spectra of polyatomic linear molecule. (5+5) marks

4. a) What is Raman scattering? Give the Quantum mechanical explanation of the effect.

b) Discuss rotational Raman spectra of linear molecules. (5+5) mark

- 5. Explain the principle of NMR spectroscopy. 10 marks
- **6.** a) Explain X-ray photoelectron spectra of gases with an example.
 - b) Explain the processes involved in X-ray fluorescence and Auger effect.(5+5) marks
