

- 2** Answer any **two** of the following :
- (a) Discuss in detail : Fine structure of Hydrogen atom spectrum. **7**
- (b) State the building rules and explain how each rule works. **7**
- (c) Discuss the spectrum of hydrogen like species by considering the example of lithium. **7**
- 3** (a) What is Paschen Back effect ? Discuss in detail. **7**
- (b) What is Zeeman effect ? How it can be categorized ? Discuss its experimental arrangement with figure. **7**
- OR**
- 3** (a) How the molecules are classified based on the relative values of principal moments of inertia ? Give at least two examples of each class. **7**
- (b) Discuss non-rigid rotator in detail. Also compare the energy levels and spectrum of rigid and non-rigid rotators. **7**
- 4** Answer any **two** of the following :
- (a) Discuss symmetric top molecules in detail showing the schematic representation of energy levels and transition for the rigid prolate and rigid oblate symmetric rotors. **7**
- (b) What is Stark effect ? Discuss the first order Stark effect of a symmetric top molecule for the $J=1, K=1 \rightarrow J=2, K=1$ transition. **7**
- (c) Explain the working of each part of Microwave spectrometer with the help of block-diagram. **7**
- 5** Write short notes on any two of the following :
- (a) Vibrating Diatomic molecule. **7**
- (b) IR spectrophotometer. **7**
- (c) Normal vibrations of CO_2 and H_2O molecules. **7**
- (d) Selection Rule and Intensity Rule. **7**