



**DHH-003-020202**

Seat No. \_\_\_\_\_

**M. Sc. (Sem. II) Examination**

**May / June – 2015**

**Physics : CT - 06**

*(Atomic and Molecular Physics)*

**Faculty Code : 003**

**Subject Code : 020202**

Time : 3 Hours]

[Total Marks : 70

- Instructions:**
- (1) Attempt **all** questions.
  - (2) All questions carry **equal** marks.
  - (3) Mathematical symbols have equal meanings.

1. Answer in brief any **seven**: **14**
  - (a) Why hydrogen spectrum is not in X-ray region? 02
  - (b) Why Schrodinger equation is known as wave equation? 02
  - (c) State the Pauli's exclusion principle. 02
  - (d) What are the differences between alkali and alkaline earth metals? 02
  - (e) What is the transition mass of hydrogen system? 02
  - (f) What is zero point energy? 02
  - (g) What are the differences between homo and heteronuclear molecules? 02
  - (h) Define the Morse curve. 02
  - (i) What is the role detector in microwave spectrometer? 02
  - (j) Define prolate and oblate symmetric top molecules. 02
2. Answer any **two** of following questions: **14**
  - (a) Write a note on different series in alkali spectra. 07
  - (b) Discuss the application of Schrodinger equation for hydrogen atom. Derive the expression of motion of free particle having mass ' $M+m$ ' and particle with mass ' $m$ '. . 07
  - (c) Interpret the results obtained from Schrodinger equation for atomic degeneracy of atomic level. 07

3. (a) Discuss the 'g' factor for LS and JJ couplings. 07  
(b) Explain vector atom model and anomalous Zeeman effect. 07

**OR**

- (a) Explain vibrating diatomic molecules and energy levels showing fundamentals, overtones and hot bands. 07  
(b) Discuss the interactions between radiation and rotating molecules. 07
4. Answer any **two** of following questions: **14**  
(a) Describe the classification of molecules based on their relative principal moments of inertia with suitable examples. 07  
(b) What is stark effect? Explain first order stark effect of a symmetric top molecules for  $J = 1, K = 1 \rightarrow J = 2, K = 1$  transition. 07  
(c) 07
5. Answer any **two** of following questions: **14**  
(a) Write a note on microwave spectrometer. 07  
(b) Explain the symmetric stretching, symmetric bending and asymmetric stretching of  $H_2O$  molecules. 07  
(c) Write a note on IR spectro-photometer. 07  
(d) Differentiate Paschen - back effect and Zeeman effect on the basis of quantum mechanical treatment. 07