Roll No. .....

74604

M. Sc. Physics 2nd Semester

Examination – May, 2016

ATOMIC & MOLECULAR PHYSICS

Paper : VIII

Time : Three Hours] *[Maximum Marks : 80*

Before answering the question, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt ***all*** questions. Each question carry equal marks.

1. (a) What are non-equivalent electrons ? Derive the term values of pf elections for LS coupling.

   (b) Calculate zeeman pattern for the transition $1F_3 \rightarrow 1_{D2}$.

   (c) What are spherical top molecules and asymmetric top molecules ?

(d) For Hcl molecule the vibrational wave number is given by 2990 cm^{-1}. Calculate the force constant.

$4 \times 4 = 16$

2. Solve the Schrodinger equation for Hydrogen atom using separation of variasles method and explain physical meaning of all the quantum numbers that appear. 16

OR

Discuss with theory the spectra of alkaline atoms by giving an example and explain the fine structure. 16

3. What is Paschen-Back effect ? Find the expression for energy shift in Paschen-Back effect for one valence electron system. How does it differ from normal Zeeman effect ? 16

OR

(a) Explain magnetic hyperfine structure and electric hyperfine structure. 12

(b) Describe intensity rules for Zeeman effect. 4

4. With necessary theory explain the energy levels of a rotating rigid hetronuclear diatomic molecule. 16

OR

Discuss intensity distribution of rotational spectra in detail. Show the intensity of absorption is proportional to J + 1 instead of 2J+1. 16

5. Discuss vibrating-rotator model for diatomic molecule. Explain P and R branch. 16

OR

Discuss harmonic oscillator model for vibrational energy levels of a diatomic molecule. Show that the frequency of the radiated light is equal to the frequency of the oscilator. 16