Roll No. …..…….. **Total Pages: 2**

PC 1232-MH

BS/2058

QUANTUM MECHANICS-II, PAPER-III

Semester-IV

Time Allowed :Three Hours] [Maximum Marks : 30

Note : The candidates are required to attempt ***two*** questions each from Sections A and B carrying **5** marks each and any ***five*** from Section C consisting of **7** short answer type questions carrying **2** marks each.

SECTION—A

1. Derive an expression for the transition probability of spontaneous emission of radiation. 5

2. What do you understand by spin-orbit coupling ? Derive an . expression for total energy of the atom in presence of spin-orbit coupling. 5

3. What is normal Zeeman effect ? Describe it with necessary theory and also find the expression for Zeeman shift. 5

4. (a) Describe Stern-Gerlach experiment to support the hypothesis of spin associated with an electron. 3.5

   (b) The wavelength of the first Balmer series of hydrogen is 6500A. Calculate the wavelength of first line of Lyman series. 3.5

SECTION—B

5. (a) State and explain Pauli's exclusion principle. 2.5
   (b) What do you understand by coupling scheme ? Discuss L-S coupling scheme. 2.5 .

6. What are X-rays ? Explain the construction and working of Coolidge X-ray tube. Give the five properties of X-rays. 5

7. What do you understand by spectrum ? Explain rotational spectrum with help of necessary theory and selection rule. Give the importance of rotational spectra. 5

8. (a) What is Auger effect ? Explain, how it takes place. 2
   (b) What is Raman effect ? How is it explained ? 3

SECTION—C

9. Attempt any ***five*** parts :

   (i) Give the physical significance of a selection rule.
   (ii) What do you understand by space quantization ?
   (iii) What is fine structure ? Give its cause.
   (iv) What do you mean by parahelium and orthohelium ?
   (v) What is Moseley's law ?
   (vi) What do you understand by molecular spectra ?
   (vii) What do you understand by exchange force ?

5x2=10