B.Sc. 4th Semester (Hons.) (New Scheme)
Examination, May–2016
PHYSICS
Paper–Phy-404
Atomic and Nuclear Physics

Time allowed : 3 hours] *[Maximum marks : 40*

Note : *Attempt five questions in all, selecting at least two questions from each unit.*

Unit–I

1. (a) Describe the Stern-Gerlach experiment and Indicate the importance of results obtained. 5

   (b) A beam of electrons enters a uniform magnetic field of flux density 1.2 Tesla. Find the energy difference between the electrons whose spins are parallel and antiparallel to the field. 3

2. (a) From vector atom model explain Normal Zeeman effect. 5

   (b) What magnetic flux density B is required to observe the normal Zeeman effect if a spectrometer can resolve spectral lines separated by 0.5A° at 5000A°? 3

3. State and explain Pauli's exclusion principle as applied to electrons in atoms. Describe how this principle helps in interpretation of the periodic system of elements. 8

4. What is L-S coupling ? Explain interaction energy in L-S coupling. 8

Unit-II

5. (a) What is nuclear binding energy ? Illustrate from the binding energy curve, the various information that can be got. 5

   (b) A nucleus with A=235, splits into two nuclei, whose mass numbers are in the ratio 2:1. Find the radii of the new nuclei. 3

6. Discuss the liquid drop model of the nucleus. Derive Weizsacker semi empirical mass formula. Mention uses of this model. 8

7. (a) Define mean (or average) life of a radioactive nuclide. Derive a relation between mean life and radioactive constant. 5

   (b) Calculate the half life time and mean life time of the radioactive substance whose decay constant is 4.28×10^{-4} per year. 3

8. Discuss the theory of successive disintegration of radioactive substance and obtain the conditions for transient and secular equilibrium. 8