MARCH-2015

**B. Sc. (Physics) Semester – V**

**Paper – 503 Sub Code 4296 : Atomic Physics and Nuclear Instrumentation**

**Time: 2:30 Hours]** **[Total Marks70**

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Instructions: 1. Symbols have their usual meaning.
2. Figures on right hand side show marks of that question.

**Q:1:**

(a) Explain the anomalous Zeeman effect using vector atom model and derive an expression of frequency of splitting spectral line number weak strong magnetic field. [10]

(b) The Cadmium line of wavelength $\lambda = 6438$ Å ($p \rightarrow s$) exhibits normal Zeeman splitting under magnetic field of 0.45T. Calculate the Zeeman components. [04]

**OR**

**Q:1:**

(a) Draw the energy transition diagram of Mercury Violet line of Anomalous Zeeman effect with tabulation. [10]

(b) Explain how L,S & J are obtained from the components of spectral term. [04]

**Q:2**

(a) Calculate the Lende-g factor for the two electron system in J – J coupling. [07]

(b) Calculate Lande's "g" splitting factor for the terms $^2D_{3/2}$ , $^2D_{5/2}$ and $^2F_{7/2}$ [07]

**OR**

**Q:2:**

(a) Discuss the results of the Stark effect. [07]

(b) Explain the evidences that led to the Shell model. [07]

**Q:3:**

(a) Explain magic numbers for neutrons with diagram. [07]

(b) Explain concept of spin-orbit coupling of an electron bound in an atom. [07]

**OR**

**Q:3:**(a) Explain about the Isomerism and Parity of nuclei. [07]
(b) Explain the main assumptions of the single-particle shell model. [07]

**Q:4:**
(a) Derive Weizsacher's semi-empirical Binding Energy formula in the case of liquid drop model. [10]
(b) Explain prediction of stability against β decay for members of an isobaric family. [04]

**OR**

**Q:4:**
(a) Write a note on families of elementary particles. [10]
(b) Explain applications of Mossbauer effect. [04]

**Q:5:**
(a) Explain the Mossbauer effect and one of the experiments where it is exploited. [08]
(b) Explain applications of NMR in chemistry. [06]

**OR**

**Q:5:**
(a) Explain in detail the technique of NMR. [09]
(b) Discuss application of NMR to determine whether valance proton possesses orbital motion in the nucleus. [05]

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