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Total No. of Printed Pages: [01]

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**M.Sc. (Chemistry) (Semester – 1<sup>st</sup>)**  
**ELECTRONIC SPECTRA & MAGNETIC PROPERTIES OF TM COMPLEXES**  
**Subject Code: MCHMS1101**  
**Paper ID: [20220201]**

**Time: 03 Hours**

**Maximum Marks: 60**

**Instruction for candidates:**

1. Section A is compulsory. It carries 16 marks. It consists of 4 questions of 4 marks each.
2. Section B consist of 4 questions of 8 marks each. The student has to attempt any 3 questions out of it.
3. Section C consist of 3 questions of 10 marks each. The student has to attempt any 2 questions.

**Section – A (4 marks each)**

- Q1. Describe the rules relating to the determination of symmetry point group of molecule.
- Q2. Construct correlation diagram for  $[\text{Ti}(\text{H}_2\text{O})_6]^{2+}$ .
- Q3. Why  $\text{KMnO}_4$  is colored though Mn in this complex does not have any unpaired electron?
- Q4. Compare the spectral properties of complexes of d block and f block elements.

**Section – B (8 marks each)**

- Q5. For ammonia molecule construct a character table and also discuss the information conveyed by a character table. List all the rules for writing Mulliken's symbol for irreducible representation.
- Q6. Discuss the factors affecting the band width in electronic spectrum.
- Q7. Discuss the splitting of s, p, d and f orbitals in octahedral and tetrahedral crystal field.
- Q8. Explain magnetic properties of complexes with first order Zeeman splitting.

**Section – C (10 marks each)**

- Q9. Write short notes on
  - a. Spectrochemical series
  - b. Curie and Curie Weiss law
  - c. Quenching of orbital magnetic moment
- Q10. Compare molecular orbital energy level diagrams for  $[\text{CoF}_6]^{3-}$  and  $[\text{Co}(\text{NH}_3)_6]^{3+}$
- Q11. Discuss the selection rules in determining the electronic transitions in complexes. In certain complexes the transitions are forbidden as per selection rule but the complex appear to be colored, why?