

**M.Sc. II Semester Degree Examination, October - 2023****INDUSTRIAL CHEMISTRY****DSC 7 : Electro, Quantum and Photochemistry****(NEP)**

Time : 3 Hours

Maximum Marks : 70

Note : Answer **any five** of the following questions with question No. **1** is **Compulsory**. Each questions carry **equal** marks.

1. (a) Explain reversible and irreversible electrodes with suitable examples. **4+3+3+4=14**
(b) Describe the application of polarography in quantitative analysis.
(c) Briefly explain the effects of temperature and pH on over voltage.
(d) Explain Buttlar-Volmer equation. State its significance.
2. (a) What is an actinometer ? Explain the working principle and procedure of uranyl oxalate actinometer. **5+5+4**
(b) Outline the kinetics of photochemical decomposition of CH_3CHO .
(c) Write a note on term symbols.
3. (a) State and explain the postulates of quantum mechanics. **5+5+4**
(b) State and prove variation theorem.
(c) Discuss the schrodinger wave equation for a particle in one dimensional box.
4. (a) Derive the relation between equilibrium constant of a reaction and partition functions of the reactants and products involved in the reaction. **5+5+4**
(b) Give a comparative note on the three statistical laws of distribution.
(c) Write a note on Sager's reciprocity relations.
5. (a) Construct the group multiplication table for the symmetry operations of ammonia molecule. **5+5+4**
(b) Describe the procedure for the classification of molecules into point groups.
(c) Derive a matrix representation for a rotational $(C_n)_n$ symmetry element.



6. (a) Discuss the application of ZnO and TiO₂ in the photodegradation of dyes. **5+5+4**
(b) Deduce an expression for first order correction to energy obtained from perturbation theory treatment.
(c) What is a photosensitization reaction ? Explain dissociation of H₂ using mercury as a photosensitizer.
7. (a) Define Hermitian operators. Prove that the momentum operator is a Hermitian. **5+5+4**
(b) Explain commutative and non-commutative properties of operators with suitable examples. How are these properties related to uncertainty relation in quantum mechanics ?
(c) Explain coupled and non-coupled reactions.
8. (a) What is Sackur Tetrode equation ? Obtain an expression for Sackur Tetrode equation for a monoatomic gas. **5+5+4**
(b) State great orthogonality theorem. Discuss its consequences and importance.
(c) Write a note on Schoenflies notations for point groups.

- o o o -

