21ICH2C7L

M.Sc. II Semester Degree Examination, Sept./Oct. - 2024
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 (Q1)** is **Compulsory**. Each question carry **equal** marks.*

---

1. (a) What is over voltage ? Explain the experimental determination of Over voltage.

   (b) Define Half-wave Potential. Write a note on applications of Polarography.

   (c) Define the terms :

   (i) Polarization and Polarizability factor

   (ii) Reversible and Irreversible electrodes.

   (d) Explain the terms :

   (i) Residual current and diffusion current.

   (ii) Activation over voltage and concentration over voltage.   **5+3+3+3=14**

2. (a) How quantum Yield is determined ? Explain.

   (b) What are actinometers ? Explain the working principle of Uranyl oxalate actinometer.

   (c) Explain the photochemical kinetics of decomposition of acetaldehyde. **5+5+4=14**

3. (a) Explain the De-Broglie concept of Wave-Particle duality.

   (b) Prove that momentum operator is Hermitian operator.

   (c) Explain the perturbation theory in quantum mechanical calculations. **5+5+4=14**

4. (a) Explain Sackur-Tetrode equation for entropy of Translational function.

   (b) Write a note on equilibrium constant and partition function.

   (c) Explain briefly about coupled and non-coupled reactions.   **5+5+4=14**

5. (a) Derive the Matric representation for a rotational C_n symmetry element.

(b) Construct the character table for C_{2v}.

(c) What are Mulliken symbols ? Explain. **5+5+4=14**

6. (a) Explain briefly the principle and applications of photocatalysts.

(b) Explain the Schrodinger wave equation for a particle in one dimensional box.

(c) Prove that momentum operator is Hermitian. **5+5+4=14**

7. (a) Explain Maxwell-Boltzmann statistics and derive the equations.

(b) Explain the determination of vibration modes using group theory.

(c) Discuss Onsager's reciprocity relations. **5+5+4=14**

8. (a) Write a note on wave equation for Hydrogen atom and find the solution for **R** and φ.

(b) Compare Bose-Einstein and Maxwell-Boltzmann Statistics.

(c) Discuss the effect of photodegradation on COD values. **5+5+4=14**

- o 0 o -