



## End Term (Odd) Semester Examination December 2024

Roll no. 2419010

Name of the Course and semester: B.Tech I Sem

Name of the Paper: Engineering Chemistry

Paper Code: TCH-101

Time: 3 hour

Maximum Marks: 100

### Note:

- All the questions are compulsory.
- Answer any two sub questions from a, b and c in each main question.
- Total marks for each question is 20 (twenty).
- Each sub-question carries 10 marks.

- Q1. (2X10=20 Marks)
- What are the conditions for Hydrogen bond formation? Discuss different types of Hydrogen bonding. Also explain why acetone is more volatile than alcohol? (CO1)
  - Draw the MOT Diagram of HF molecule. Also report its bond order and magnetic nature. (CO1)
  - Write a short note on (i) Metallic Bonding (ii) Nanomaterials. (CO1)

- Q2. (2X10=20 Marks)
- Describe about the ion exchange process for water softening with the help of proper chemical reactions. (CO2)
  - Write a short note on (i) Scale and Sludge Formation (ii) Reverse Osmosis (CO2)
  - Calculate the temporary and permanent hardness of water sample which on analysis have:  
 $\text{Ca}(\text{HCO}_3)_2 = 4.05 \text{ ppm}$ ;  $\text{Mg}(\text{HCO}_3)_2 = 36.5 \text{ ppm}$ ;  $\text{MgSO}_4 = 15 \text{ ppm}$ ,  $\text{CaSO}_4 = 17 \text{ ppm}$ ,  $\text{CaCl}_2 = 2.775 \text{ ppm}$ , silica = 10 ppm and  $\text{MgCl}_2 = 9.5 \text{ ppm}$  (CO2)

- Q3. (2X10=20 Marks)
- Explain conducting polymers with its types and applications. (CO3)
  - Differentiate between thermoplastic and thermosetting polymers. Write the preparation, properties and uses of Bakelite. (CO3)
  - Write a short note on (i) Biodegradable Polymers (ii) PET (CO3)

- Q4. (2X10=20 Marks)
- Define the term Biogas. What are the major components of Biogas. Explain Biogas plant with neat and clean diagram. (CO4)
  - Write a short note on (i) Characteristics of a good fuel (ii) Bomb Calorimeter (CO4)
  - Define gross and net calorific value of a fuel. 1.28 g sample of a fuel was completely burnt in excess of oxygen using bomb calorimeter. The rise in temperature of water in calorimeter was  $2.5^\circ\text{C}$ . Calculate the high and net calorific value of a fuel, if  $\text{H}\% = 6.5$ , the water taken in calorimeter is 700 g and water equivalent for calorimeter is 2200g. Latent heat of condensation = 587 cal/gm (CO4)

- Q5. (2X10=20 Marks)
- Describe about electrode potential. Also discuss the factors affecting electrode potential. How the redox reaction is responsible for emf of the cell? (CO5)
  - Write a short note on (i) Concentration Cell (ii) Electrochemical theory of Corrosion. (CO5)
  - Calculate the cell potential of a cell:  $\text{Cr(s)}/\text{Cr}^{+3}(0.1 \text{ M})/\text{Fe}^{+2}(0.01 \text{ M})/\text{Fe(s)}$   
Given  $E^\circ_{\text{Cr}^{+3}/\text{Cr}} = -0.74 \text{ V}$ ;  $E^\circ_{\text{Fe}^{+2}/\text{Fe}} = -0.44 \text{ V}$  (CO5)