Assignment I (12-Hour Task)

AY 2024-2025 Semester: II

Course Title: Engineering Chemistry **Course Code:** CHY1001
Course Coordinator: Dr. Suranjan De **Assignment Setter:** Dr. Aman Kumar
Date: [20/02/2025] **Total Marks: [30]**
Due Date & Time: [27/02/2025, 11.30 PM]

Q.1. How many grams of $FeSO_4$ are required to dissolve per litre to prepare a water sample of 210.5 ppm hardness? [**2 marks**]

Q.2. Calculate the temporary and permanent hardness of a water sample containing $Ca(HCO_3)_2$ = 162 mg/L; $Mg(HCO_3)_2$ = 73 mg/L; $MgCl_2$ = 95 mg/L; $CaSO_4$ = 136 mg/L. [**2 marks**]

Q.3. A water sample on analysis gave the following data: Ca^{2+} = 30 mg/L; Mg^{2+} = 24 mg/L; CO_2 = 24 mg/L; HCl = 50 mg/L; K^+ = 10 mg/L. Calculate the quantities of lime (90% pure) and soda (94% pure) required to soften one thousand litre of water. [**4 marks**]

Q.4. A standard hard water contains 0.15 g of $CaCO_3$ per liter. About 20 mL of this solution required 25 mL of EDTA solution and 100 mL of the sample water required 18 mL of EDTA solution. The same sample after boiling required 12 mL EDTA solution. Calculate the temporary hardness of the given sample of water in ppm. [**4 marks**]

Q.5. What are ion exchange resins? How can you purify water by using these resins? What are the advantages of this method over zeolite method? [**4 marks**]

Q.6. Briefly describe the free radical mechanism of polymerization of 1, 3 butadiene. [**4 marks**]

Q.7. Equal masses of polymers with molar masses M_1 =10,000 and M_2 = 100,000 are mixed together. Calculate number average (M_n) and weight average (M_w) molar masses of the mixture. [**4 marks**]

Q.8. Complete the following reactions that involve the process of softening of water with soda and lime [**2 marks**]

i. $Ca(HCO_3)_2 + Ca(OH)_2 \longrightarrow$
ii. $MgCl_2 + Ca(OH)_2 \longrightarrow$
iii. $CaCl_2 + Na_2CO_3 \longrightarrow$
iv. $CO_2 + Ca(OH)_2 \longrightarrow$

Q9. Briefly describe the cationic polymerization of 1, 3 butadiene. **[4 Marks]**