Name:

Enrolment No:

UPES

End Semester Examination, May 2023

Course: Process Chemistry **Semester: II**

Program: B.Tech Chemical Engineering **Time : 03 hrs.**

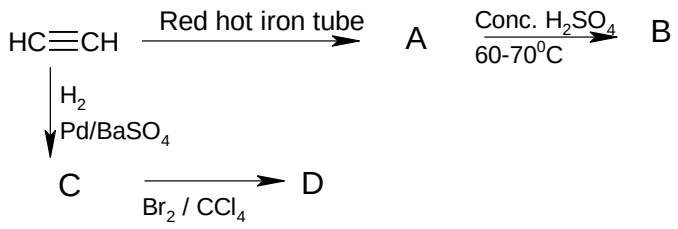
Course Code: CHCE1001 **Max. Marks: 100**

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	Write short note on biofuels.	**4**	**CO1**
Q 2	State the conditions under which Type II and III adsorption isotherms are obtained.	**4**	**CO3**
Q 3	Name the types of hardness present in the water. Give two examples for each.	**4**	**CO4**
Q 4	i) What is galvanic corrosion? ii) Identify the monomers from the following compounds; (a) $CH_3CH=CH_2$ (b) CH_3COOH (c) HO_2HCCH_2OH (d) CH_3CH_3	**2** **2**	**CO2** **CO5**
Q 5	A pure metal rod half immersed vertically in water starts corrosion. corrosion. Give reason.	**4**	**CO2**

SECTION B
(4Qx10M= 40 Marks)

Q 6	Draw the neat sketch of ion-exchange process and describe the process of water softening and regeneration.	**10**	**CO4**
Q 7	(i) Define octane and cetane number. (ii) A sample of coal was analyzed as follows: Exactly 1.5g was weighed in a silica crucible. After heating for one hour at 110°C, the residue weighed 1.415g. The crucible next was covered with a vented lid and strongly heated for exactly 7 minutes at 950±20°C. The residue weighed 0.528g. The crucible was then heated without cover, until a constant weight was obtained. The last residue was found to weigh 0.145g. Calculate the % results of the above analysis.	**4** **6**	**CO1**

Q 8	(i) Explain the following processes of synthesis of nanomaterials a) Microemulsion technique b) Chemical Precipitation technique (ii) Calculate the polydispersity index of polyethylene having the following molecular weight distribution; 20 g of molecular weight 35,000 g/mol 10 g of molecular weight 80,000 g/mol	**5** **5**	**CO5**
Q 9	(i) Complete the following reactions  (ii) Explain the pressure swing adsorption. Give any one of its advantage and disadvantage. **OR** (i) 0.1237 g of an organic substance gave on combustion 0.256 g of CO_2 and 0.1015 g of water. Calculate the % of carbon and hydrogen in it. (ii) What are zeolites? Describe any three of its properties which make them as excellent adsorbents.	**5** **5** **5** **5**	**CO1** **CO3** **CO1** **CO3**
	SECTION-C **(2Qx20M=40 Marks)**		
Q 10	(i) Conductometric titration is performed between acetic acid (CH_3COOH) and sodium hydroxide (NaOH), explain the variation of conductivity in acetic acid with addition of NaOH with the help of suitable graph. Explain it. (ii) What is a sacrificial anode? Mention its role in corrosion control. (iii) 100 ml of water sample consumed 20 ml of 0.01 N sulphuric acid at phenolphthalein end point. As the titration is continued with methyl orange indicator, end point occurred at 30 ml of 0.01 N sulphuric acid. Identify and quantify the different alkalinity present in the water sample in $CaCO_3$ equivalent. (iv) State the reactions by which lime and soda remove the hardness causing salts from the water.	**6** **4** **6** **4**	**CO2** **CO2** **CO4** **CO4**
Q11	(i) Comment on the following properties of nanomaterials (a) Optical property (b) Catalytic activity (ii) Construct an electrochemical cell for the reaction $2Fe^{+3}(aq) + Sn^{+2}(aq) \rightarrow 2Fe^{+2}(aq) + Sn^{+4}(aq)$	**5** **5**	**CO5** **CO2**

	Calculate equilibrium constant for the reaction. Given; $E^{\circ}_{Fe^{+3}/Fe^{+2}}$ = +0.77V and $E^{\circ}_{Sn^{+4}/Sn^{+2}}$ = +0.15V.		
	(iii) Explain the mechanism of anionic addition polymerization. Why is it called living polymerization?	**6**	**CO5**
	(iv) How does amount of adsorption vary with increase in temperature and pressure?	**4**	**CO3**
	OR		
	(i) Elucidate applications of nanomaterials.	**5**	**CO5**
	(ii) Explain principle of potentiometric titration with suitable graph.	**5**	**CO2**
	(iii) Explain any one of the polymerization technique.	**6**	**CO5**
	(iv) Equilibrium constant of adsorption of nitrogen on zeolite is 0.6. Calculate the fraction of surface area of zeolite covered by nitrogen at 5 bar when it obeys Langmuir adsorption isotherm.	**4**	**CO3**