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| **Name:**<br>**Enrolment No:** | |

**UPES**

**End Semester Examination, May 2024**

**Course: Process Chemistry** **Semester: II**

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

**Course Code: CHCE1002** **Max. Marks: 100**

**Instructions: Read all the instructions below carefully and follow them strictly.**

1) **Mention Roll No. at the top of the question paper.**
2) **Internal choice is given in Q. no. 9 and 10.**
3) **ATTEMPT ALL THE PARTS OF A QUESTION AT ONE PLACE ONLY.**

**SECTION A**
**(5Qx4M=20Marks)**

| S. No. | | Marks | CO |
|---|---|---|---|
| Q 1 | Distinguish the following with an example for each.<br>(i) Homochain and heterochain polymer<br>(ii) Addition and condensation polymer | **4** | **CO1** |
| Q 2 | Define adsorption and give any two industrial separation involving adsorption. | **4** | **CO3** |
| Q 3 | Explain the determination of order of a reaction by graphical method. | **4** | **CO2** |
| Q 4 | Discuss any four factors which affects the rate of a chemical reaction. | **4** | **CO2** |
| Q 5 | Find the interplanar distance in a crystal in which a series of planes produce a first order reflection from a copper X-ray tube ($\lambda$= 1.539 A$^o$) at an angle of 22.5$^o$ | **4** | **CO2** |
| | **SECTION B**<br>**(4Qx10M= 40 Marks)** | | |
| Q 6 | Classify the adsorption processes based on mode of operation and mode of regeneration. Explain any one method of adsorption of each classification in detail with the help of diagram | **10** | **CO2** |
| Q 7 | For the given cell: Cr(s) $\vert$ $Cr^{+3}$(aq, 0.01M) $\Vert$ $Ag^{+}$(aq, 0.1M) $\vert$ Ag(s); Write down the cell reaction and calculate the EMF of the cell, if $E^{\circ}_{Cr+3/Cr}$ = -0.744V and $E^{\circ}_{Ag+/Ag}$ = +0.80V | **10** | **CO3** |
| Q 8 | Elaborate the various application of nanomaterials in the category of<br>(i). Nanocomposites (ii) Nanowires (iii) Nanocrystals (iv) Quantum dots | **10** | CO2 |

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| Q 9 | Discuss the working and construction of a bomb calorimeter with the help of a suitable diagram.<br>**OR**<br>(A). During estimation of nitrogen present in organic compound by Kjeldahl's method, 0.257 g of an organic substance was heated with conc. sulphuric acid and then distilled with excess of strong alkali. The ammonia gas evolved was absorbed in 25 ml of N/5 HCl, which required 23.2 ml of N/10 NaOH for neutralization. Determine the % of nitrogen in the substance.<br>(B). 0.1986 g of an organic substance gave on combustion 0.3850 g of $CO_2$ and 0.1802 g of $H_2O$. Calculate the % of carbon and hydrogen in it. | **10** | **CO1** |
| **SECTION-C<br>(2Qx20M=40 Marks)** | | | |
| Q 10 | (A) Name any of the five methods of molding plastics. Identify the suitable molding method for producing plastic insulated electric wire and explain the same with the help of diagram.<br>(B) A water sample is not alkaline to phenolphthalein. However, 100ml of water sample reached the end point of titration using methyl-orange as indicator with 36.5ml of 0.02N HCl. What are the types and amount of alkalinity present in water.<br>(Or)<br>(A) List the different techniques of polymerization. Describe any one of them in detail and give each one of its advantages and disadvantages.<br>(B) A 100ml sample of water required 13.5ml of 0.02 M EDTA solution for titration using EBT as indicator. Another 100ml of water from the same source was boiled and precipitates were removed by filtration. The filtrate required 6ml of 0.02 M EDTA for titration. Calculate total hardness, permanent hardness and temporary hardness of water sample | **10+10**<br>**10+10** | **CO3**<br>**CO3** |
| Q 11 | (A) 100 moles of polypropylene are found to have the following molecular weight distribution.<br>25 mol of molecular weight 50,000 g/mol<br>50 mol of molecular weight 75,000 g/mol<br>Remaining mol of molecular weight 100,000 g/mol<br>Calculate the number average and weight average molecular weights.<br>(B). Explain the factors which affect the rate of corrosion.<br>(C). Why is pitting corrosion much more dangerous to provoke catastrophic failure than oxidation corrosion. | **10 +7+3** | **CO2** |