Name: Enrolment No:	

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2022

Course: Corrosion Engineering — **Semester: VII**
Program: B. Tech (APE-Gas) — **Time : 03 hrs.**
Course Code: CHCE 3025P — **Max. Marks: 100**

SECTION A
(6Qx10M=60Marks)

S. No.		Marks	CO
Q 1	Discuss about a. Intergranular Corrosion b. Distance effect in Galvanic Corrosion	5+5	CO1
Q 2	Derive the expression for Nernst equation	10	CO2
Q 3	Illustrate and Discuss the following a. Activation polarization, b. Concentration polarization, and c. Combined polarization	4+3+3	CO3
Q 4	a. An engineer is designing a high-speed dental drill. The materials used for the drill must have high strength, good heat resistance, and thermal stability. What types of steel should the engineer consider for this application? Justify b. An engineer is designing a sheet metal frame for a small business machine. What mechanical properties would be important for this material? What materials should the engineer consider for this application? Justify	5+5	CO5
Q 5	a. Discuss the several guidelines for corrosion failure. b. Explain in detail about metallurgical failure analysis.	5+5	CO4
Q 6	List out various methods used to prevent corrosion. Discuss cathodic and anodic protection	10	CO3

SECTION B
(2Qx20M= 40 Marks)

Q 7	Determine whether Fe is stable in 10^{-6} M aerated water solution of Fe^{2+} at a pH of 3, 5, 8. Estimate (a) The Gibbs free-energy change and (b) The cell potential of the corrosion cell. The activity coefficients are assumed to be 1. The hydrogen pressure is 1 atm. Half cell reactions: Fe ------→ Fe^{2+} + 2e	20	CO2

	½ O_2 + H_2O + 2e ----------→$2OH^-$ Fe (s) + ½ O_2 (g) + H_2O (l) ----------→ $Fe(OH)_2$ $e°_{O2}/OH^-$ = 0.401 $e°_{Fe/Fe2+}$ = 0.440 **Instruction: Assume suitable values if any data is missing**		
Q 8	List out various alloy systems. Describe carbon and low alloy steels and stainless steels emphasizing environments in which they find extensive applications	**20**	**CO4**