

Name:	 UPES UNIVERSITY WITH A PURPOSE
Enrolment No:	

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2021

Course: Corrosion Engineering
Program: B. Tech (APE-Gas)
Course Code: CHCE 3025P

Semester: V
Time 03 hrs.
Max. Marks: 100

SECTION A
Answer all the Questions

S. No.		Marks	CO
Q 1	Explain about the following with neat diagram a. Fretting and cavitation Corrosion b. Area effect in Galvanic Corrosion	5+5	CO1
Q 2	List out various methods used to prevent corrosion. Mention various design rules to prevent from corrosion	10	CO3
Q 3	a. Derive the expression for Nernst equation b. Mention the advantages and limitations of Pourbaix diagram	5+5	CO2
Q 4	List out various types of electrochemical polarization. Illustrate, and discuss any two of them.	5+5	CO3
Q 5	a. An engineer is designing a head for a nine-iron golf club. The part requires a high impact strength and resistance to distortion. 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 6	Analyze and evaluate the prevention of corrosion damage with neat diagrams	10	CO4

SECTION B
Answer all the Questions

Q 7	a. Calculate the theoretical tendency of Nickel to corrode (in volts) with evolution of hydrogen when immersed in 0.02 M NiCl ₂ acidified to pH=6. Cell Reaction: Ni -----→Ni ²⁺ + 2e (anode) H ₂ -----→ 2H ⁺ + 2e (Cathode) Ni + 2H ⁺ -----→Ni ²⁺ + H ₂ (overall) $e^{\circ}_{Ni/Ni^{2+}} = 0.25$	7+13	CO2
	b. Calculate the theoretical tendency of cobalt to corrode (in volts) in deaerated water of pH=5, 6, 7, and 8. Assume corrosion products are hydrogen and Co(OH) ₂ . The solubility product: $K_{Co(OH)_2} = [Co^{+2}][OH^-]^2 = 1.6 \times 10^{-17}$. Cell notation: Co/Co ⁺² //H ⁺ /H ₂ . 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	CO5