UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2020

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

Instructions: Answer all the questions from Section-A and Section-B

SECTION A
Answer all the Questions

S. No.		Marks	CO

Q 1	Discuss about
	    a. Intergranular Corrosion
	    b. Distance effect in Galvanic Corrosion
		5+5	CO1

Q 2	List out various methods used to prevent corrosion. Describe the Cathodic protection to prevent corrosion	10	CO3
Q 3	a. Derive the expression $\Delta G = -nFE$ b. Determine whether tin is stable in 10^{-6} M Sn^{2+} acid solution of pH=2. Estimate (a) the Gibbs free-energy change and (b) the cell potential for the corrosion cell. The activity coefficients are assumed to be 1. The hydrogen pressure is 1 atm. **Instruction: Assume suitable values if any data is missing**	5+5	CO2
Q 4	A tin immersed in sea water shows a corrosion current density of 3.45×10^{-6} A/cm^2. What is the rate of corrosion in mdd and mpy.	5+5	CO3
Q 5	Describe the concept of Exchange Current density (Considering the Current density (not the current) is extremely important in the concept of exchange current density. Explain or Justify)	10	CO3
Q 6	a. Discuss the several guidelines for corrosion failure. b. Explain in detail about metallurgical failure analysis.	5+5	CO4
	SECTION B **Answer all the Questions**		
Q 7	Calculate the theoretical tendency of cobalt to corrode (in volts) in deaerated water of pH=5 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**	20	CO2
Q 8	List out various alloy systems. Describe stainless steels and nickel alloys emphasizing environments in which they find extensive applications	20	CO5