

Name:	 UPES UNIVERSITY WITH A PURPOSE
Enrolment No:	

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2019

Course: Corrosion Science & Technology
Program: B. Tech Mech Sp. Pro/Th/MD/MSNT
Course Code: MTEG 471

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

- Instructions: 1. Use graph sheet wherever required.**
2. Assume data if required and mention it clearly at the top of your answer.

SECTION A (20 marks)

S. No.		Marks	CO
1	i. This form of corrosion occurs due to concentration difference in a component (a) Uniform (b) Galvanic (c) Inter-granular (d) Stress ii. When Pt and Co are electrically connected, which one gets corroded (a)Pt (b) Co (c) None (d) Can't decide iii. Which of the following can be used for cathodic protection (a)Al (b) Cd (c) Cu (d) Either iv. Knife line attack is also known as (a)Weld decay b. filiform corrosion c. Cavitation damage d. None v. Type of corrosion in weld decay: a. Intergranular b. Crevice c. Pitting d. any of the three vi. Passivity is due to a. Higher EMF b. Lower EMF c. Oxide film d. All vii. Passivity is not reason for inertness of a. Au b. Al c. Ti d. Ni viii. When passivity is achieved measured current density becomes: a. Zero b. positive c. negative d. None ix. During redox reaction at equilibrium net current becomes: a. Zero b. positive c. negative d. None x. Sensitization is formation of _____ carbide: a. Nb b. Cr c. Cb d. All	10	CO1
2	Describe galvanizing.	5	CO1
3	Explain SHE with the help of a neat sketch.	5	CO1

SECTION B (40 marks)

4	Determine whether silver will corrode with hydrogen evolution in deaerated KCN solution, pH = 9, when CN^- activity = 1.0 and $\text{Ag}(\text{CN})_2^-$ activity is 0.001. OR Determine whether copper will corrode in deaerated CuSO_4 , pH = 0, to form Cu^{2+} (activity = 0.1) and H_2 (1 atm). What is the corrosion tendency in volts?	10	CO2
5	Analyze the data given and answer the questions. Steel plate with copper rivets and a copper plate with steel rivets, both are exposed to sea water for 2 years. $E^0_{\text{Cu}^{2+}/\text{Cu}} = +0.340$, $E^0_{\text{Fe}^{2+}/\text{Fe}} = -0.440$ a) Which joint is much stronger with aspect of corrosion? Why? b) Discuss the form of corrosion associated with this problem. c) Suggest one measure to reduce the rate of corrosion of the joint using same materials.	4 4 2	CO3
6	a) Discuss selective leaching with an example. b) Suggest some preventive measures for it. c) Give one advantageous application of selective leaching.	4 4 2	CO1
7	What is the volume (at room temperature) of hydrogen evolved on Pt and Ni electrodes of 5cm x 5cm x 0.2cm immersed in an aqueous solution of pH 3, when held at -0.7V (SHE) for one week? The exchange current density for H^+/H on both the metals respectively are $7.94 \times 10^{-4} \text{ A/cm}^2$ and (b) $6.3 \times 10^{-6} \text{ A/cm}^2$. Assume pH_2 to be 0.5 atm. The Tafel slopes are $\beta_a = 60 \text{ mV/decade}$ and $\beta_c = 100 \text{ mV/decade}$.	10	CO2
SECTION-C (40 marks)			
8	A. Explain hot corrosion. List the properties that an oxide film should have in order to be protective in high temperature conditions. B. Describe inhibitors. Explain passivating inhibitors along with its two types. Write one drawback of passivating inhibitors.	10 10	CO3
9	Describe anodic polarization and derive the expression for it. OR Describe concentration polarization and derive the expression for it.	20	CO3