UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, April/May 2018

Course: Corrosion Tech. /Mat. Degradation & its prevention **Semester: VI**
Program: B. Tech MSNT
Time: 03 hrs. **Max. Marks: 100**

Instructions: 1. Use graph for Q. 10.
2. Write "to the point" answers.
3. Assume data only if required and mention the assumption clearly.

SECTION A: 20 marks

S. No.		Marks	CO
Q 1	List the properties of oxide layer to be protective. Discuss Hot corrosion.	**5**	**CO1**
Q2	Describe Galvanic corrosion. List various preventive measures for it.	**5**	**CO1**
Q3	Differentiate between passivating inhibitors and precipitation inhibitors.	**5**	**CO4**
Q4	Derive the expression to measure corrosion rate in terms of depth of penetration.	**5**	**CO2**

SECTION B: 40 marks

Q5	Explain the two cathodic protection methods.	**10**	**CO4**
Q6	Define Passivity. Describe all the regions of passivation curve with the help of a neat & labelled sketch. **OR** Describe anodic protection method. Compare it with cathodic protection methods.	**10** **10**	**CO4** **CO4**
Q7	Calculate the corrosion rate of the given alloy in terms of mdd and mpy. i_{corr} = 1 $\mu A/cm^2$.	**10**	**CO2**

Elements	n	%	Density (g/cm^3)	Atomic weight
Cr	1	18	7.1	52
Ni	2	8	8.9	58
Mo	1	4	10.2	95.95
Fe	2	70	7.86	55.85

Q8	Calculate the corrosion potential and corrosion rate of Zn in 1M HCl solution. Assume that the entire Zn surface act as anode as well as cathode and the Tafel slopes are 60 mV/decade and the exchange current densities for Zn and hydrogen are 10^{-5} and 10^{-9} A/cm^2 respectively. $E^0_{Zn2+/Zn}$ = -0.763 V	**10**	**CO2**

SECTION-C: 40 marks (20 marks each)

Q9	A. List various factors that may lead to intergranular corrosion. B. Describe the process of sensitization.	**6** **6**	**CO3** **CO3**

	C. (i) Explain weld decay along with preventive measures. OR (ii) Explain knife line attack in detail.	**8** **8**	**CO1** **CO1**
Q 10	Case 1: Pieces of Iron and metal Zinc with same dimensions are dipped in de-aerated HCl solution in two different beakers. Case 2: Pieces of Iron and Zinc with same dimensions are dipped in HCl solutions are connected. Exchange current density values are given: i_0 (H_2 on Zn) = 10^{-11} A/cm^2, i_0 (H_2 on Fe) = 10^{-5} A/cm^2, i_0 (Zn) = 10^{-7} A/cm^2, i_0 (Fe) = 10^{-5} A/cm^2. Make a comparative analysis of corrosion rates of iron and zinc in both the cases with the help of a neat plot.	**20**	**CO2**