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

Programme Name: B.Tech (CE+RP)   Semester   : VIII
Course Name   : Corrosion Engineering   Time   : 03 hrs
Course Code   : MTEG364   Max. Marks : 100

Nos. of page(s)   : 2

Instructions: *The question paper consists of three sections. Answer the questions section wise.*
Note: ***Assume suitable data wherever necessary***

SECTION A
(This section includes multiple choice questions and fill in the blanks)
(Answer all questions)

S. No.		Marks	CO

Q1	(i) What is the most common method to measure soil electrolyte resistivity
	   a. 4 pin Wenner method
	   b. 8 pin Wenner method
	   c. Resistivity meter
	   d. 4 pin Wendy method
	
	(ii) Ferritic stainless steel immunity to
	   a. Crevice corrosion
	   b. Stress corrosion cracking
	   c. Pitting corrosion
	   d. Erosion corrosion
		(2.5 + 2.5)	CO4

Q2	(i) A galvanic cell is formed
	   a. When two metals are immersed in solutions differencing in concentration
	   b. When two different metals are immersed in one electrolyte
	   c. When two different metals are exposed to dry air
	   d. When two metals are brought close together and electrically insulated from one another
	
	(ii) Why do metals such as gold, silver and platinum corrode slowly or not at all?
	   a. They are noble metals and therefore corrode slowly
	   b. They form a protective oxide on their surface and therefore corrode slowly
	   c. They are shiny and therefore corrode slowly
	   d. They are active metals and therefore corrode slowly
		(2.5 + 2.5)	CO3

Q3	(i) In an impressed current cathodic protection system... (More than one option may apply)
	   a. Anode is connected to positive pole of a power supply
	   b. Anode is connected to negative pole of a power supply
		(2.5 + 2.5)	CO2

	c. Structure is connected to negative pole of a power supply
	d. Structure is connected to positive pole of a power supply
	
	(ii) Identify in which of the scenarios below cathodic protection can be applied.
	
	    a. Above ground power lines
	    b. Railway tracks
	    c. Submerged part of ship
	    d. Pipelines		

Q4	(i) Complete the following sentence. In an electrolyte...
	
	    a. Electrical charge is carried by positive ions
	    b. Electrical charge is carried by negative ions
	    c. Electrical charge is carried by positive ions and negative ions
	    d. Electrical charge is carried by free ions
	
	(ii) Why does zinc corrode in hydrochloric acid?
	    a. The acid is corrosive
	    b. The acid has a pH of 1
	    c. Metal ions are stable in solution
	    d. Zinc hydroxide forms on the surface
		(2.5 + 2.5)	CO1

Q5	A). Anodic polarization defined as _____ B). Cathodic polarization defined as _____	(2.5 + 2.5)	CO1

Q6	Iron electrode is cathodically polarized in an aqueous medium and the iron potential is -0.716 V vs. SCE and -0.75 V vs. SHE for the hydrogen reaction
	$2H^+ + 2e^- \rightarrow H_2$, $e^o_{H^+/H_2} = 0.00\ V$ vs. SHE or -0.241 V vs. SCE.
	    A). The hydrogen overpotential at pH = 5 against SCE _____
	    B). The hydrogen overpotential at pH = 5 against SHE _____
		(2.5 + 2.5)	CO3

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SECTION B
(Answer all questions, Question 9 has internal choice)

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Q7	**Calculate** the concentration of Zn^{2+} ions required to stop the zinc corrosion when Zn is immersed in a solution of $FeCl_2$ with activity of Fe^{2+} = 0.1 M. Standard electrode potentials: $e^o_{Zn^{+2}/Zn} = -0.762\ V$ vs. SHE, $e^o_{Fe^{+2}/Fe}$ = -0.44 V vs SHE.	10	CO3
Q8	**Discuss** in detail about cash flow and capital budget techniques in corrosion engineering projects.	10	CO5
Q9	a. **Summarize** key design to prevent corrosion. (OR) b. **Summarize** corrosion coatings.	10	CO2
Q10	**Criticize** corrosion in concrete environment	10	CO4
Q11	**Illustrate** stainless steel alloys and its corrosion behavior.	10	CO4

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SECTION-C

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Q12	**Explain** in detail about different forms of corrosion and their preventions.	20	CO1