UTHM
Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2021/2022

COURSE NAME	:	CORROSION & PREVENTION
COURSE CODE	:	BDB 40403
PROGRAMME CODE	:	BDD
EXAMINATION DATE	:	JULY 2022
DURATION	:	3 HOURS
INSTRUCTION	:	1. ANSWER **ALL** QUESTIONS 2. THIS FINAL EXAMINATION IS CONDUCTED VIA **CLOSED BOOK** 3. STUDENTS ARE **PROHIBITED** TO CONSULT THEIR OWN MATERIAL OR ANY EXTERNAL RESOURCES DURING THE EXAMINATION CONDUCTED VIA CLOSED BOOK

THIS QUESTION PAPER CONSISTS OF **FIVE (5)** PAGES

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Q1 (a) A steel screw is attached to a steel body, with time, the area at the bottom of the screw starts to corrode. Choose suitable solutions to prevent this corrosion from happen.

(5 marks)

(b) Examine how the atmospheric corrosion can be measured.

(7 marks)

(c) Evaluate the need of cathodic protection for some construction with suitable sketch.

(8 marks)

Q2 (a) According to the emf series in **Table Q2 (a)**, zinc has a more reactive potential than iron. Therefore zinc should corrode more easily than iron, but, surprisingly, iron will corrode faster than zinc. Interpret this situation.

(5 marks)

(b) What are the differents between sacrificial anode and impressed current in cathodic protection.

(7 marks)

(c) With an appropriate diagram, briefly explain about anodic protection

(8 marks)

Q3 (a) Differentiate between activation polarization and concentration polarization with an appropriate diagram.

(5 marks)

(b) Explain how to measure uniform corrosion

(7 marks)

(c) Do you think the best way to control the corrosion attack is during design stage? Give your opinion with suitable sketch.

(8 marks)

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Q4 (a) Describe the regimes of framework for treating atmospheric corrosion.

(5 marks)

(b) Distinguish between uniform and localized corrosion.

(7 marks)

(c) Justify why in certain circumstances, volatile corrosion inhibitor is more efficient compared to applying coating.

(8 marks)

Q5 (a) Interpret the corrosion attack for metal X and metal Y in the **Figure Q5 (a)**

(5 marks)

(b) Explain the major factors affecting atmospheric corrosion.

(7 marks)

(c) Analysis of data for cathodic protection need to ensure sufficient current supplied to the buried piping system. Evaluate this situation.

(8 marks)

-END OF QUESTION-

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Table Q2(a): emf series

Half-Cell Reaction	E^o (volts)
$F_2 + 2e \longrightarrow 2F^-$	2.87
$Au^+ + e \longrightarrow Au^+$	1.68
$Cl_2 + 2e \longrightarrow 2Cl^-$	1.36
$O_2 + 4H^+ + 4e \longrightarrow 2H_2O$	1.229
$O_2 + 4H^+ (10^{-7}\ M) + 4e \longrightarrow 2H_2O$	0.82
$Ag^+ + e \longrightarrow Ag$	0.799
$Fe^{3+} + e \longrightarrow Fe^{2+}$	0.771
$O_2 + 2H_2O + 4e \longrightarrow 4OH^-$	0.48
$Cu^{2+} + 2e \longrightarrow Cu$	0.337
$AgCl(s) + e^- \rightarrow Ag(s) + Cl^-(aq)$	0.22
$2H^+ + 2e \longrightarrow H_2$	0.0000
$Pb^{2+} + 2e \longrightarrow Pb$	-0.126
$Sn^{2+} + 2e \longrightarrow Sn$	-0.14
$Ni^{2+} + 2e \longrightarrow Ni$	-0.25
$Co^{2+} + 2e \longrightarrow Co$	-0.28
$Fe^{2+} + 2e \longrightarrow Fe$	-0.44
$Cr^{3+}(aq) + 3e^- \rightarrow Cr(s)$	-0.74
$Zn^{2+} + 2e \longrightarrow Zn$	-0.763
$Al^{3+} + 3e \longrightarrow Al$	-1.66
$Mg^{2+} + 2e \longrightarrow Mg$	-2.34
$Na^+ + e \longrightarrow Na$	-2.714
$Ca^{2+} + 2e \longrightarrow Ca$	-2.87
$K^+ + e \longrightarrow K$	-2.925

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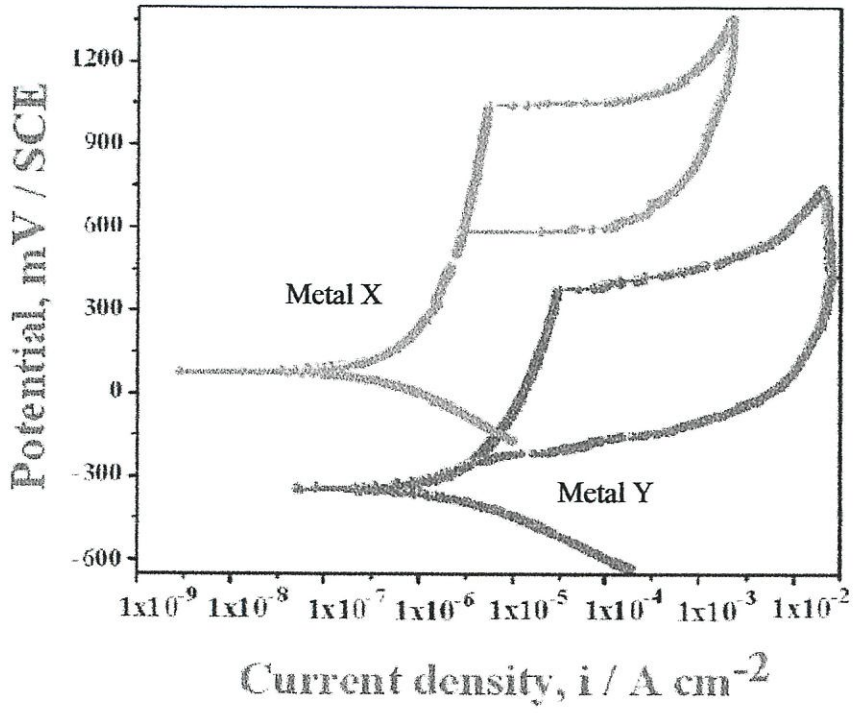

Figure Q5 (a)

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