

Name:

Enrolment No:



**UNIVERSITY OF PETROLEUM AND ENERGY STUDIES**  
**End Semester Examination, December 2018**

**Course: B.Tech (APE Gas)**  
**Program: B.Tech (APE Gas)**

**Semester: V**  
**Time: 03 hrs.**

**Subject: Corrosion Engineering**  
**Code: MTEG 365**

**Max. Marks: 100**

**Instructions:** \*The question paper consists of two sections. Answer the questions section wise in the answer booklet.

**Note:** Assume suitable data wherever necessary

**SECTION A**

**Attempt all the questions. All questions carry equal marks**  
**Total Marks=60**

S. No.		Marks	CO																				
Q1	Discuss various stainless steel alloys, which can lead to corrosion.	10	CO4																				
Q2	Explain pourbaix diagrams for aluminum and iron.	10	CO2																				
Q3	What is electrochemical nature of a corrosion? Explain uniform corrosion, galvanic corrosion, crevice corrosion, pitting corrosion and erosion corrosion.	5+5	CO1																				
Q4	(a) Explain mixed potential theory. (b) Determine the corrosion rate of AISI 316 steel alloy corresponding to 1 $\mu\text{A}/\text{cm}^2$ of current. Composition of the AISI 316 alloy: Cr - 18%, Ni - 8%, Mo - 2%, and Fe -70%. Properties of alloy is given below: <table border="1" data-bbox="376 1524 1172 1789"><thead><tr><th>Atoms</th><th>Number of electrons losing, n</th><th>Density, <math>\rho</math> (gm/cm<sup>3</sup>)</th><th>Atomic weight, a (gm/mole)</th></tr></thead><tbody><tr><td>Cr</td><td>1</td><td>7.1</td><td>52.3</td></tr><tr><td>Ni</td><td>2</td><td>8.9</td><td>58.71</td></tr><tr><td>Mo</td><td>1</td><td>10.2</td><td>95.95</td></tr><tr><td>Fe</td><td>2</td><td>7.86</td><td>55.65</td></tr></tbody></table>	Atoms	Number of electrons losing, n	Density, $\rho$ (gm/cm <sup>3</sup> )	Atomic weight, a (gm/mole)	Cr	1	7.1	52.3	Ni	2	8.9	58.71	Mo	1	10.2	95.95	Fe	2	7.86	55.65	5+5	CO3
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Q5	What is the importance of material design to prevent corrosion?	10	CO4																				
Q6	What is standard hydrogen electrode and explain corrosion preventions.	10	CO2																				

**SECTION-B (Total Marks-40)**  
**Answer all questions.**

Q7	What is concentration polarization and activation polarization? Derive equations for anodic overpotential and cathodic overpotential.	<b>5+15</b>	<b>CO3</b>
Q8	Discuss the physical metallurgy of titanium alloys. Explain the mechanical properties and corrosion behavior of titanium in specific environment.	<b>20</b>	<b>CO5</b>