

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE - SEMESTER-V (NEW) EXAMINATION – WINTER 2023****Subject Code: 3152116****Date:05-12-2023****Subject Name: Environmental Degradation of Materials****Time:10:30 AM TO 01:00 PM****Total Marks:70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

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|------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| <b>Q.1</b> (a) A metal tank has flat bottom and experiences corrosion at corner. Suggest remedy to avoid corrosion without changing material.        | <b>03</b>    |
| (b) If pure copper and pure zinc metal are in contact in presence of corrosive media. Predict which metal will corrode? Why?                         | <b>04</b>    |
| (c) Pipe bends in pipeline fails preferentially. Suggest cause of failure? Explain mechanism and prevention for it.                                  | <b>07</b>    |
| <b>Q.2</b> (a) Briefly explain faraday's law of electrolysis.                                                                                        | <b>03</b>    |
| (b) Explain fretting corrosion mechanism.                                                                                                            | <b>04</b>    |
| (c) Write brief note on hydrogen damage.                                                                                                             | <b>07</b>    |
| <b>OR</b>                                                                                                                                            |              |
| (c) Write detailed note on wear and its measurement methods.                                                                                         | <b>07</b>    |
| <b>Q.3</b> (a) Explain uniform corrosion and its prevention.                                                                                         | <b>03</b>    |
| (b) Discuss mechanism of cavitation damage with neat sketch.                                                                                         | <b>04</b>    |
| (c) What lead to pit formation by pitting corrosion in material? Write detailed note on pitting corrosion mechanism.                                 | <b>07</b>    |
| <b>OR</b>                                                                                                                                            |              |
| <b>Q.3</b> (a) What is inhibitor? List different types of inhibitor.                                                                                 | <b>03</b>    |
| (b) How to avoid IGC of austenitic stainless steel.                                                                                                  | <b>04</b>    |
| (c) Write in brief about anodizing and galvanizing coating for corrosion control.                                                                    | <b>07</b>    |
| <b>Q.4</b> (a) Why zinc coating of iron protect from corrosion even if coating break?                                                                | <b>03</b>    |
| (b) If instead of zinc coating, tin coating is used, iron undergoes severe corrosion. Explain why.                                                   | <b>04</b>    |
| (c) If stabilized austenitic stainless steel is exposed to more than 1200 °C, it become prone to corrosion. Explain why and how it can be prevented. | <b>07</b>    |
| <b>OR</b>                                                                                                                                            |              |
| <b>Q.4</b> (a) What is sensitization temperature range for austenitic stainless steel? Explain phenomena of sensitization.                           | <b>03</b>    |
| (b) Suggest ways to avoid galvanic corrosion.                                                                                                        | <b>04</b>    |
| (c) Write note on different methods for corrosion rate measurement.                                                                                  | <b>07</b>    |
| <b>Q.5</b> (a) What is stress corrosion cracking? Give example where SCC results.                                                                    | <b>03</b>    |
| (b) Briefly explain pourbaix diagram for metal water system.                                                                                         | <b>04</b>    |
| (c) Write detailed note on polarization.                                                                                                             | <b>07</b>    |
| <b>OR</b>                                                                                                                                            |              |
| <b>Q.5</b> (a) Justify corrosion is reverse of extractive metallurgy.                                                                                | <b>03</b>    |
| (b) Explain method of impressed current cathodic protection.                                                                                         | <b>04</b>    |
| (c) Brass preferentially loose zinc in presence of corrosive media. Predict corrosion and explain its mechanism.                                     | <b>07</b>    |

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