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National Institute of Technology-Hamirpur

End Term Examination, November 2023

B. Tech. 7<sup>th</sup> Semester,

MS-412: Corrosion Science and Engineering

Duration: 180 min

Max. Marks: 50

Note

- This question paper consists of 8 questions
- Attempt all questions
- Wherever necessary, the diagram drawn should be neat and properly labelled

- 1) Write short notes on following : ( with possible schematics, wherever needed) (12)
  - a) Cavitation damage mechanism
  - b) Anodic and Cathodic protection
  - c) Modes of Fretting Corrosion failures
  - d) Two examples of Stress Corrosion Cracking
- 2) How do weld decay and knife-line attacks differ, and what measures can be taken to prevent these failures? (4)
- 3) Explain the selective leaching failure mechanism and outline its various modes of occurrence? (4)
- 4) Describe the various components of an electrochemical cell and provide a method for calculating corrosion rates through electrochemical testing? (4)
- 5) (a) Explain the concept of corrosion thermodynamics? Suppose a steel rod is placed in aerated water, then what will be the possibility of the corrosion? (given:  $E^{\circ}_{ox} = 0.447$  V,  $E^{\circ}_{red} = 0.820$  V) (4)  
(b)  $Zn/Zn^{+2}(0.1M)//Ag^{+1}(1M)/Ag$  is the cell notation of zinc dissolution in silver. What is the Electrode potential of the cell formed? ( $T=298K$ ,  $F=96500$ ) ( $E^{\circ}_{Ag} = 0.80V$ ,  $E^{\circ}_{Zn} = -0.763V$ ) (2)  
(c) What will be the penetration rate of Al alloy, equivalent to  $1\mu A/cm^2$  current density? ( Given: Equivalent weight of Al= 26.97, density= 2.71 g/cc, constant  $K= 0.128$ ) (2)
- 6) What is the mechanism of corrosion fatigue? What is the influence of various environmental factors on corrosion fatigue behaviour, and what measures can be taken to prevent it? (6)

- 7) Describe the erosion corrosion mechanism and identify the factors that affect erosion corrosion. (6)
- 8) Define hydrogen damage and outline the various types of hydrogen-related failures, along with potential prevention measures. (6)