

DEGRADATION OF MATERIALS AND THEIR PROTECTION (MT 704)

Time: 3 hours

Full marks 70

Answer any seven questions

All questions carry equal marks

- 1 (a) What is polarisation? Explain with suitable examples, how polarisation influences corrosion processes.
(b) What is exchange current density? Discuss its importance in corrosion. [(5+5)]
- 2 (a) Differentiate between EMF series and Galvanic series. Why is latter more useful in the prediction of galvanic corrosion?
(b) Explain with examples, the area effect in galvanic corrosion. [7+3]
- 3 (a) Describe the phenomenon and mechanism of weld decay in austenitic stainless steels.
(b) What is cavitation damage? [8+2]
- 4 (a) Discuss briefly the electrochemical mechanisms of stress corrosion cracking and observations in their support.
(b) Discuss the phenomenon and cause of high temperature hydrogen attack in steels. [5+5]
- 5 Explain why:
(a) Even the stabilized stainless steels are also some time prone to inter-granular corrosion.
(b) Copper does not corrode in air-free acids.
(c) Oxidisers are some time referred to as dangerous inhibitors.
(d) Sulphides are detrimental for steel for use in sour environment. [2½ × 4]
- 6 (a) Briefly discuss the mechanism of formation and growth of oxidation.
(b) Discuss the mechanism of p-type and n-type oxide film. Discuss the effect of oxidation rate on doping the lower and higher valance materials in the n-type and p-type oxide film. [4+6]
- 7 (a) A 100 mm² cross section sample of 99.9 wt % nickel, 0.8mm thick, is oxidized in oxygen at 1atm. pressure at 600°C. After 2 hours, the sample shows a weight gain of 70µgms/cm². If this material shows parabolic oxidation behaviour, what will the weight gain be after 20hours?
(b) Discuss briefly the various types of oxidation rate laws with example.
(c) Mention various methods used for applying metallic coats. [4+4+2]

- 8 (a) Discuss briefly the mechanisms of absorption inhibitors and oxidizer inhibitors to prevent the corrosion.
- (b) Discuss briefly the mechanism of formation of adhesive and abrasive wear. [5+5]
- 9 (a) Discuss briefly the oxidation resistance materials.
- (b) Differentiate between anodic and cathodic metallic coatings.
- (c) Differentiate between cathodic and anodic film forming inhibitors. [3+4+3]
- 10 Write briefly on (any three):
- (a) Anodic protection
- (b) Pilling- Bedworth ratio
- (c) Cathodic protection
- (d) Wear resistance materials