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Total Number of Pages : 02

B.Tech
PCMT4403

7th Semester Regular/Back Examination: 2017-18

Corrosion and Degradation of Materials

BRANCH : METTA, MME, PLASTIC

Time: 3 Hours

Max Marks: 70

Q.CODE: B298

Answer Question No.1 which is compulsory and any five from the rest.

The figures in the right hand margin indicate marks.

Q1 Answer the following questions : (2 x 10)

- a) Explain the effect of corrosion and importance of studying corrosion.
- b) What are important types of corrosion on the basis of appearance?
- c) What is mixed potential theory?
- d) What are polarization and over voltage?
- e) What is galvanic corrosion?
- f) Pitting corrosion is more dangerous than uniform corrosion: why?
- g) Dealloying can be advantageous: How?
- h) Time to failure is an important parameter to judge stress corrosion behavior of metals and alloys: Why?
- i) What are major differences between stress corrosion cracking and corrosion fatigue?
- j) What are general preventive measures for stress corrosion cracking?

Q2 a) Standard reduction potential series does not relate to practical corrosion problem. Galvanic series is more useful in predicting corrosion tendency of a metal or alloy. Explain. (5)

b) Prove $E_{Ag/AgCl} = 0.224 - 0.059pH$ for a silver-silver chloride reference electrode. (5)

Q3 a) What is passivation? Explain galvanic coupling on the passivation for Fe-Pt couple in acid solution. (5)

b) How many ways one can protect a metallic component from corrosion? Show detail classification. (5)

Q4 a) Show the principles of cathodic and anodic protection with the help of mixed potential theory. (5)

b) What is active passive metal? It is better to go for anodic protection in case of active passive metal than cathodic protection at the same level of protection: Why? (5)

Q5 a) Find out the corrosion rate of Fe in sea water if the current density is 6.0×10^{-6} A/cm² in (a) mdd, (b) mmy⁻¹ and (c) mpy. (5)

b) Show the importance of ion size, diffusivity and boundary layer thickness on the limiting current density and concentration polarization. (5)

Q6 a) Show graphically different components of cathodic and anodic polarization (both activation and concentration polarization). (5)

b) What are half cell reaction and redox reaction? Define standard reduction potential. What is its significance? (5)

Q7 What is Pourbaix diagram? Show different parts of Pourbaix diagram with proper illustration. Show the significance and limitation of Pourbaix diagram. Show that: $O_2 + 2H_2O + 4e = 4OH^-$ and $O_2 + 4H^+ + 4e = 2H_2O$ fall on the same line in a Pourbaix diagram. **(10)**

Q8 Write short answer on any TWO : **(5 x 2)**

- a) Hydrogen embrittlement.
- b) Crevice corrosion
- c) Ellingham diagram
- d) Zinc corrosion in pure acid.