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# INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

B.Tech I Semester End Examinations (Regular) - December, 2016

**Regulation: IA – R16**

## ENGINEERING CHEMISTRY

(Common for all branches)

**Time: 3 Hours**

**Max Marks: 70**

**Answer ONE Question from each Unit**

**All Questions Carry Equal Marks**

**All parts of the question must be answered in one place only**

### UNIT – I

1. (a) Describe the construction and working of lead - acid storage battery. Give the reactions that occur during discharge. Mention its applications. [7M]  
 (b) Write the cell representation and calculate the EMF for the cell reaction: [7M]  
 $Zn_{(s)} + Fe^{2+} (0.005) \leftrightarrow Zn^{2+} (0.01 M) + Fe_{(s)}$ . Given,  $E^0$  values of iron and zinc are -0.44 V and -0.76 V respectively.
2. (a) Derive the Nernst equation for a single electrode potential. [7M]  
 (b) What is a reference electrode? Give the construction and working of calomel electrode with reactions. [7M]

### UNIT – II

3. (a) What are the different reactions taking place at the cathode during corrosion? How do cathodic inhibitors work to reduce the rate of these reactions (Mention any two)? [7M]  
 (b) Explain the process of tinning and galvanizing with example. [7M]
4. (a) What is cathodic protection? Explain the sacrificial anode method of protection. [7M]  
 (b) Discuss the effect of the following factors on rate of corrosion [7M]
  - i. Nature of metal
  - ii. Nature of environment

### UNIT – III

5. (a) Explain the determination of hardness of water by complexometric method. [7M]  
 (b) A sample water of 100 ml required 12.6 ml of 0.02 M EDTA solution with EBT as indicator and 8.4 ml of 0.02 M EDTA for the same volume of water after removing the carbonate hardness. Calculate the total, permanent and temporary hardness in terms of calcium carbonate equivalents. [7M]

6. (a) Compare and contrast the temporary and permanent hardness of water. [7M]  
(b) Calculate temporary and permanent hardness of a water sample which contains 6.8mg of  $CaSO_4$ , 33mg of  $CaCl_2$ , 40mg of  $Na_2SO_4$ , 24mg of  $MgSO_4$  per liter of the water sample. (Given Molar mass of Ca=40g, Na=23g, Mg=24g, S=32g, O=16g, Cl=35.0g) [7M]

#### UNIT – IV

7. (a) Differentiate addition and condensation polymerisation. Give suitable examples. [7M]  
(b) What are refractories? Explain how they are classified and give atleast two advantages. [7M]
8. (a) Define and differentiate thermoplastic and thermosetting polymers (any 5 points). Give an example for each type [7M]  
(b) What is cement? Discuss the merits and demerits of dry and wet process for the manufacture of Portland cement. [7M]

#### UNIT – V

9. (a) What is cracking? Explain the process of fixed bed catalytic cracking of petroleum. [7M]  
(b) Explain Ultimate analysis of coal along with its significance [7M]
10. (a) Describe fractional distillation of petroleum mentioning the components, composition, boiling point ranges and applications. [7M]  
(b) A sample of coal was found to have the following % composition by weight. C = 70%, H= 6%, O = 14%, N=5% and rest is ash. Calculate GCV and NCV. [7M]