Question Paper Code: AHS005

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]**