USN | | | | | | | | | | **14CHE12**

First Semester B.E. Degree Examination, Dec.2014/Jan.2015
Engineering Chemistry

Time: 3 hrs.   Max. Marks:100

Note: *Answer any FIVE full questions, selecting atleast ONE question from each part.*

PART-1

1 a. Derive Nernst's equation for single electrode potential.   (05 Marks)
   b. Describe the construction and working of calomel electrode.   (05 Marks)
   c. What are batteries? Explain the following battery characteristics :
       i) Capacity   ii) Cycle life.   (05 Marks)
   d. Describe the construction and working of nickel metal hydride battery.   (05 Marks)

2 a. What are Reference electrodes? Explain the determination of electrode potential of an
       unknown electrode using calomel electrode.   (05 Marks)
   b. What are concentration cells? The emf of the cell Ag 1 AgNO$_3$ (0.0083M) II AgNO$_3$ (x M) I Ag
       was found to be 0.074V at 298K. Calculate the value of x and write cell reaction.
                                                                                   (05 Marks)
   c. Define fuel cell. Explain the construction and working of methanol oxygen fuel cell.
                                                                                   (05 Marks)
   d. Explain the construction ana working of lithium ion battery: (05 Marks)

PART-2

3 a. Explain the electrochemical theory of corrosion by taking iron as an example.   (05 Marks)
   b. What is Corrosion? Explain the following factors affecting the rate of corrosion :
       i) Nature of corrosion product   ii) Anodic and Cathodic areas .   (05 Marks)
   c. What is Electro less plating? Write the difference between electroplating and electroless
       plating.   (05 Marks)
   d. Discuss the electroplating of gold using Acidic Cyanide bath.   (05 Marks)

4 a. What is Anodising? Explain the anodizing of aluminium.   (05 Marks)
   b. What is Cathodic protection? Explain sacrificial anodic method and impressed current
       method.   (05 Marks)
   c. Explain the effect of any two factors on the nature of electro deposit.   (05 Marks)
   d. Explain the process of electroless plating of copper with relevant reaction S.   (05 Marks)

PART —3

5 a. What is Cracking? Explain the fluidized catalytic cracking process.   (05 Marks)
   b. On burning 0.76 x 10^{-3}kg of a solid fuel in a bomb calorimeter, the temperature of 2.5kg of
       water is increased from 25°C to 28°C. The water equivalent of calorimeter and latent heat of
       steam are 0.486kg and 2457 kJ/kg respectively. Calculate its GCV and NCV. Given Sp.
       Heat = 4.187 kJ / kg / $^{\circ}$C and % of H2 is 2.5.   (05 Marks)
   c. Discuss the production of solar grade silicon by Union — Carbide process.   (05 Marks)
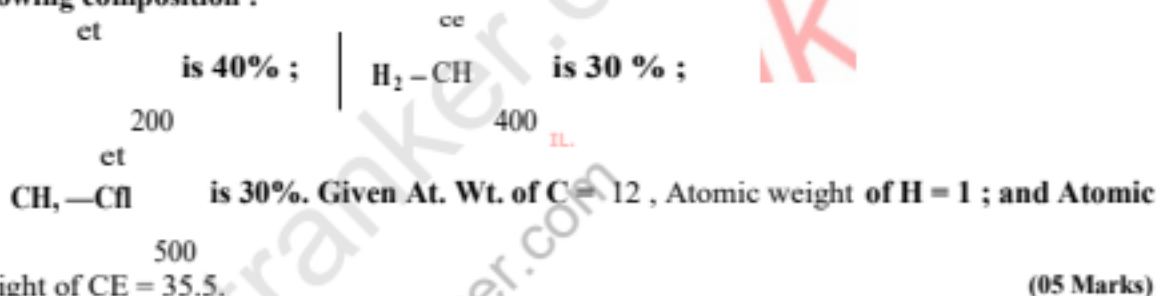   d. What are the advantages and disadvantages of PV — cells?   (05 Marks)

6   a. Explain the determination of calorific value of a solid fuel using bomb calorimeter.
                                                                                    (05 Marks)
     b. Define the following terms :
        i) Chemical fuel   ii) Calorific value   iii) Biodiesel   iv) Octane number
        v) Reforming of petrol.   (05 Marks)
     c. Discuss the construction and working of a PV — cell.   (05 Marks)
     d. What is doping? Discuss the purification of silicon of zone - refining.   (05 Marks)

PART - 4

7   a. Explain the free radical mechanism of addition polymerization by taking Vinyl chloride as a
        monomer.   (05 Marks)
     b. What are adhesives? Explain the synthesis and applications of epoxy resin. (05 Marks)
     c. Write the synthesis and applications of the following polymers
        i) Polymethyl methacrylate ii) Teflon.   (05 Marks)
     d. What are polymer composites? Explain the preparation and uses of Kevlar fiber.   (05 Marks)

8 a. Calculate the number average and weight average molecular mass of a polymer with the
     following composition :

$$\underset{200}{\overset{et}{\text{ }}} \text{ is 40\% ;} \qquad \underset{400}{\overset{ce}{H_2-CH}} \text{ is 30 \% ;}$$

$$\underset{500}{\overset{et}{CH, —Cfl}} \text{ is 30\%. Given At. Wt. of C = 12 , Atomic weight of H = 1 ; and Atomic}$$

     weight of CE = 35.5.   (05 Marks)
  b. What is glass transition temperature? How is it affected by
     i) Intermolecular forces   ii) Flexibility.   (05 Marks)
  1. What is Conducting polymer? Explain the mechanism of conduction in polyaniline
                                                                                    (05 Marks)
  d. Give the synthesis and uses of the following polymers :
     i) Silicon rubber   ii) polycarbonates.   (05 Marks)

PART -5

9   a. What is boiler feed water? Explain the scale and sludge formation in boiler. Mention their ill
        effects.   (05 Marks)
     b. What is desalination? Explain the desalination of saline water by electro dialysis.   (05 Marks)
     c. What are nano materials? Explain the synthesis of nano material by Sol — gel method.
                                                                                    (05 Marks)
     d. Write a note on carbon nano tubes.   (05 Marks)

10 a. Define COD. Calculate the COD of the effluent sample when 25cm^3 of the effluent sample
      requires 8.5cm^3 of 0.001 N K.2 Cr2 07 solution for complete oxidation.   (05 Marks)
   b. Discuss in detail the softening of water by ion — exchange process.   (05 Marks)
   c. Explain the synthesis of nanomaterials by hydro thermal process.   (05 Marks)
   d. What are Fullerences? Explain the synthesis and uses of fullerenes.   (05 Marks)