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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 : (05 Marks)
 - i) Capacity
 - ii) Cycle life.
 - 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 $\text{Ag} | \text{AgNO}_3 (0.0083\text{M}) || \text{AgNO}_3 (x \text{ M}) | \text{Ag}$ 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 and 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 : (05 Marks)
 - i) Nature of corrosion product
 - ii) Anodic and Cathodic areas .
 - 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 reactions. (05 Marks)

PART – 3

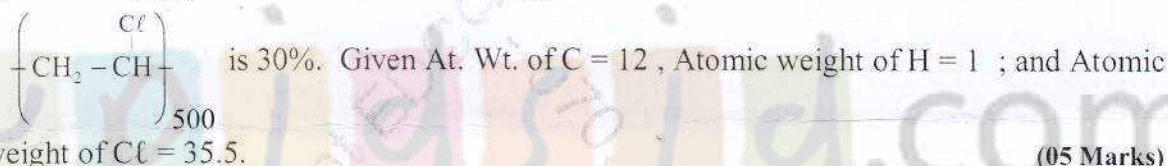
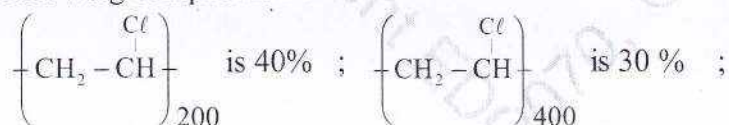
- 5
 - a. What is Cracking? Explain the fluidized catalytic cracking process. (05 Marks)
 - b. On burning 0.76×10^{-3} kg of a solid fuel in a bomb calorimeter, the temperature of 2.5kg of water is increased from 25°C to 28°C . The water equivalent of calorimeter and latent heat of steam are 0.486kg and 2457 kJ/kg respectively. Calculate its GCV and NCV. Given Sp. Heat = 4.187 kJ / kg / $^\circ\text{C}$ and % of H_2 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 :



- b. What is glass transition temperature? How is it affected by
 i) Intermolecular forces ii) Flexibility. (05 Marks)
- c. 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 $0.001\text{ N K}_2\text{Cr}_2\text{O}_7$ 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 Fullerenes? Explain the synthesis and uses of fullerenes. (05 Marks)
