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**First/Second Semester B.E. Degree Examination, June / July 2014**  
**Engineering Chemistry**

Time: 3 hrs.

Max. Marks:100

**Note: 1. Answer any FIVE full questions, choosing at least two from each part.****2. Answer all objective type questions only on OMR sheet page 5 of the answer booklet.****3. Answer to objective type questions on sheets other than OMR will not be valued.****PART – A**

- 1 a. Choose the correct answers for the following : (04 Marks)**
- i) Calomel electrode is reversible with respect to,  
 A)  $\text{Cl}^-$  ion                      B)  $\text{Ag}^+$  ion                      C)  $\text{Hg}_2^{2+}$  ion                      D) None of these
- ii) A galvanic cell converts:  
 A) Electrical energy in to chemical energy  
 B) Chemical energy in to electrical energy  
 C) Electrical energy in to heat energy  
 D) None of these
- iii) The  $E^\circ$  value of the cell  $\text{Zn}/\text{Zn}^{2+} \parallel \text{Fe}^{2+}/\text{Fe}$  is if  $E^\circ_{\text{Fe}^{2+}} = -0.44$  and  $E^\circ_{\text{Zn}^{2+}} = -0.76$   
 A) +0.32 V                      B) +1.2 V                      C) -0.32V                      D) -1.2V
- iv) Example of an ion selective electrode is,  
 A) Calomel electrode                      B) Hydrogen electrode  
 C) Platinum electrode                      D) Glass electrode
- b. What is single electrode potential? Obtain an expression for the same. (05 Marks)**
- c. What are reference electrodes? Explain the construction and working of Calomel electrode. (05 Marks)**
- d. An electrochemical cell is constructed by immersing a silver wire in  $\text{AgNO}_3$  solution of 0.5 M and a Cadmium wire in  $\text{CdSO}_4$  solution of 0.25 M at  $25^\circ\text{C}$ . Write the cell diagram, cell reaction and calculate emf of the cell and change in free energy. Given  $E^\circ_{\text{Ag}^+} = +0.80$  and  $E^\circ_{\text{Cd}^{2+}} = -0.40$ ,  $F = 96.5 \text{ KJ/kg/V}$  (06 Marks)**
- 2 a. Choose the correct answers for the following : (04 Marks)**
- i) The density of  $\text{H}_2\text{SO}_4$  to be maintained in the lead-acid storage cell is,  
 A) 0.5                      B) 1.2                      C) 2.4                      D) None of these
- ii) In which battery, a key component is separated from rest of the battery prior to activation.  
 A) Primay                      B) Secondary                      C) Reserve                      D) None of these
- iii) The reaction taking place at anode of a battery,  
 A) Reduction                      B) Addition                      C) Neutralization                      D) Oxidation
- iv) The electrolyte used in  $\text{H}_2 - \text{O}_2$  fuel cell is,  
 A) KOH                      B) Nacl                      C)  $\text{NH}_4\text{OH}$                       D) Kcl
- b. Explain the following battery characteristics:**  
 i) Voltage                      ii) Energy storage density                      iii) Cycle life (06 Marks)
- c. Explain the construction and working of Ni – Cd battery. (06 Marks)**
- d. Explain the construction and working of  $\text{H}_2 - \text{O}_2$  fuel cell and mention its applications. (04 Marks)**

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
 2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

- 3 a. Choose the correct answers for the following : (04 Marks)
- Development of non porous and uniform oxide film over a metal surface due to corrosion,
    - Decreases the corrosion rate
    - Increases the corrosion rate
    - Does not have any effect
    - None of these
  - Galvanizing is the process of coating of iron,
    - With Au
    - With Zn
    - With Cu
    - None of these
  - Which of the following is an example of cathodic coating,
    - Galvanizing
    - tinning
    - painting
    - None of these
  - Evolution of hydrogen type of corrosion occurs in,
    - Acidic medium
    - Basic medium
    - Both a and b
    - None of these
- b. What is metallic corrosion? Explain the electro chemical theory of corrosion. (05 Marks)
- c. Discuss the effect of the following factors on corrosion rate:
- Nature oxide film
  - Anodic to cathodic area
  - Polarization
- (06 Marks)
- d. Explain the following corrosion control methods:
- Use of inhibitor
  - Galvanisation
- (05 Marks)
- 4 a. Choose the correct answers for the following : (04 Marks)
- Technological importance of metal finishing is to impart,
    - Corrosion resistance
    - Solderability
    - Thermal resistance
    - All of these
  - Use of complexing agent during electrode deposition is to,
    - Obtain shining deposit
    - To check the metal ion concentration
    - Increase current density
    - None of these
  - The process used to manufacture P.C.B is,
    - Electroplating
    - Electrolessplating
    - Phosphating
    - None of these
  - Electroless plating process is possible only on,
    - Catalytically active surface
    - Inactive surface
    - Any surface
    - Only on plastic surface
- b. What is metal finishing? Mention any 3 technological importance of metal finishing. (04 Marks)
- c. Explain the factors that influence the nature of electrodeposit,
- pH of electrolytic bath;
  - temperature
  - current density
- (06 Marks)
- d. What is electroless plating? Explain the process of electroless plating of copper. (06 Marks)

**PART – B**

- 5 a. Choose the correct answers for the following : (04 Marks)
- Methyl tertiary butyl ether is added to gasoline to,
    - To increase the cetane number
    - Minimize the knocking
    - To increase the efficiency of diesel
    - All of these
  - Which of the following posses zero octane number,
    - Iso Octane
    - $\alpha$ -Methyl naphthalene
    - n – heptane
    - Cyclohexane
  - Photovoltaic cell is a,
    - Storage cell
    - Rechargeable cell
    - Fuel cell
    - Energy conversion device
  - Knocking is due to,
    - Slow combustion
    - Incomplete combustion
    - Instantaneous explosive combustion
    - All of these
- b. What is calorific value of a fuel? Explain the bomb calorimeter method to determine calorific value of a solid fuel. (06 Marks)

- 5 c. Calculate the gross and net calorific value of a coal sample from the following data:  
 i) Weight of coal – 0.73 g    ii) Weight of water taken in calorimeter 1500 g    iii) Water equivalent of calorimeter = 470 g    iv) Rise in temperature  $2.3^{\circ}\text{C}$     v) Percentage of hydrogen in coal sample 2.5%    vi) Latent heat of steam is  $587 \text{ calg}^{-1}$ .    (05 Marks)
- d. Explain the methods of doping of silicon to get solar grade silicon.    (05 Marks)
- 6 a. Choose the correct answers for the following :    (04 Marks)
- i) Gibbs phase rule for general system:  
 A)  $P + I = C - 2$     B)  $P + F = C - 1$     C)  $P + F = C + 1$     D)  $P + F = C + 2$
- ii) Which of the following is a one component system,  
 A) Water system    B) Lead – Silver system  
 C) Iron – Carbon system    D) None of these
- iii) Absorbance of light by a solution of a substance depends on,  
 A) Path length    B) Concentration of solution  
 C) Wavelength of incident light    D) All of these
- iv) Flame photometry is suitable for the detection of,  
 A) Li    B) Cu    C) Fe    D) Zn
- b. State phase rule. Discuss the application of phase rule to water system.    (05 Marks)
- c. Explain the principle and application of potentiometric titration with respect to redox titration.    (06 Marks)
- d. Discuss the conductometric titration and mention the advantages.    (05 Marks)
- 7 a. Choose the correct answers for the following :    (04 Marks)
- i) Which of the following is a copolymer?  
 A) Polythene    B) Nitrile rubber    C) PVC    D) Plexi glass
- ii) Requirement for conductivity in polymer is,  
 A) Linear structure    B) Presence of oxidising or reducing agents  
 C) Conjugation    D) All of these
- iii) Natural rubber is polymerized form of,  
 A) Chloroprene    B) Isoprene    C) Propene    D) None of these
- iv) Benzoyl peroxide is used as,  
 A) Initiator    B) Terminator    C) Propagator    D) None of these
- b. What is polymerization? Explain the addition polymerization's mechanism by taking polyethylene as example.    (05 Marks)
- c. Explain the mechanism of conduction in polyacetylene.    (05 Marks)
- d. Explain the manufacture of following polymers and mention the uses:  
 i) Polymethyl methacrylate.    ii) Neoprene.    (06 Marks)
- 8 a. Choose the correct answers for the following :    (04 Marks)
- i) Alkalinity in water is not due to,  
 A)  $\text{H}^+$     B)  $\text{OH}^-$     C)  $\text{CO}_3^{2-}$     D)  $\text{HCO}_3^-$
- ii) The titrant used in estimation of total hardness of water is,  
 A) EDTA    B) E.B.T    C) NaCl    D) KOH
- iii) The reagent used in the estimation of sulphate ion in water is,  
 A) Phenoldisulfonic acid    B) SPANDS  
 C) Alumina    D) Barium Chloride
- iv) Temporary hardness of water is due to,  
 A)  $\text{Ca}(\text{HCO}_3)_2$     B)  $\text{CaCl}_2$     C)  $\text{CaSO}_4$     D)  $\text{MgSO}_4$
- b. What is desalination of water? Explain electro dialysis method.    (05 Marks)
- c. Explain the experimental method of determination of total hardness of water.    (06 Marks)
- d. 50 ml of sample of water consumed 15 ml of 0.01 M EDTA, before boiling and 5 ml of the same EDTA, after boiling. Calculate the total hardness, permanent hardness and temporary hardness.    (05 Marks)

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