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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)
- Calomel electrode is reversible with respect to,
 A) Cl^- ion B) Ag^- ion C) Hg_2^{2+} ion D) None of these
 - 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
 - The E° 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
 - 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 AgNO_3 solution of 0.5 M and a Cadmium wire in CdSO_4 solution of 0.25 M at 25°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)
- The density of H_2SO_4 to be maintained in the lead-acid storage cell is,
 A) 0.5 B) 1.2 C) 2.4 D) None of these
 - 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
 - The reaction taking place at anode of a battery,
 A) Reduction B) Addition C) Neutralization D) Oxidation
 - The electrolyte used in $\text{H}_2 - \text{O}_2$ fuel cell is,
 A) KOH B) NaCl C) NH_4OH 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,
A) Decreases the corrosion rate B) Increases the corrosion rate
C) Does not have any effect D) None of these
 - Galvanizing is the process of coating of iron,
A) With Au B) With Zn C) With Cu D) None of these
 - Which of the following is an example of cathodic coating,
A) Galvanizing B) tinning C) painting D) None of these
 - Evolution of hydrogen type of corrosion occurs in,
A) Acedic medium B) Basic medium C) Both a and b D) 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:
i) Nature oxide film ii) Anodic to cathodic area iii) Polarization (06 Marks)
- d. Explain the following corrosion control methods:
i) Use of inhibitor ii) Galvanisation (05 Marks)
- 4 a. Choose the correct answers for the following : (04 Marks)
- Technological importance of metal finishing is to impart,
A) Corrosion resistance B) Solderability
C) Thermal resistance D) All of these
 - Use of complexing agent during electrode deposition is to,
A) Obtain shining deposit B) To check the metal ion concentration
C) Increase current density D) None of these
 - The proess used to manufacture P.C.B is,
A) Electopating B) Electrolessplating C) Phosphating D) None of these
 - Electroless plating process is possible only on,
A) Catalytically active surface B) Inactive surface
C) Any surface D) 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,
i) pH of electrolytic bath; ii) temperature iii) 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,
A) To increase the cetane number B) Minimize the knocking
C) To increase the efficiency of diesel D) All of these
 - Which of the following posses zero octane number,
A) Iso Octane B) α -Methyl naphthalene
C) n - heptane D) Cyclohexane
 - Photovoltaic cell is a,
A) Storage cell B) Rechargeable cell
C) Fuel cell D) Energy conversion device
 - Knocking is due to,
A) Slow combustion B) Incomplete combustion
C) Instantaneous explosive combustion D) 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°C v) Percentage of hydrogen in coal sample 2.5% vi) Latent heat of steam is 587 cal g^{-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)
- Gibbs phase rule for general system:
 A) $P + I = C - 2$ B) $P + F = C - 1$ C) $P + F = C + 1$ D) $P + F = C + 2$
 - Which of the following is a one component system,
 A) Water system B) Lead – Silver system
 C) Iron – Carbon system D) None of these
 - 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
 - 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)
- Which of the following is a copolymer?
 A) Polythene B) Nitrile rubber C) PVC D) Plexiglass
 - Requirement for conductivity in polymer is,
 A) Linear structure B) Presence of oxidising or reducing agents
 C) Conjugation D) All of these
 - Natural rubber is polymerized form of,
 A) Chloroprene B) Isoprene C) Propene D) None of these
 - 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)
- Alkalinity in water is not due to,
 A) H^{+} B) OH^{-} C) CO_3^{2-} D) HCO_3^{-}
 - The titrant used in estimation of total hardness of water is,
 A) EDTA B) E.B.T C) NaCl D) KOH
 - The reagent used in the estimation of sulphate ion in water is,
 A) Phenoldisulfonic acid B) SPANDS
 C) Alumonia D) Barium Chloride
 - Temporary hardness of water is due to,
 A) $\text{Ca}(\text{HCO}_3)_2$ B) CaCl_2 C) CaSO_4 D) MgSO_4
- b. What is desalination of water? Explain electrodialysis 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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