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First/Second Semester B.E. Degree Examination, June 2012
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 your answers for the following : (04 Marks)
- The standard reduction potential of Mn and Fe are – 1.18 V and – 0.44 V respectively. The standard emf of cell formed by combining the above two electrodes will be
 A) + 0.74 V B) – 0.74 V
 C) + 1.62 V D) – 1.62 V.
 - Primary reference electrode used to measure the electrode potential of other electrodes is
 A) SHE B) Calomel electrode
 C) Glass electrode D) Silver – silver chloride electrode
 - Reference electrode used in potentiometric determinations is
 A) Glass electrode B) Pt-electrode
 C) Calomel electrode D) Ion selective electrode
 - If the direction of flow of electrons in electrochemical cell is right to left then the cell reaction is
 A) Non spontaneous B) Spontaneous
 C) Reversible D) Irreversible.
- b. An electrochemical cell consists of metallic zinc immersed in 0.1 M $\text{Zn}(\text{NO}_3)_2$ solution and metallic copper immersed in 0.2 M CuSO_4 solution. Calculate emf of the cell at 25°C and change in free energy of the cell reaction $E^\circ_{\text{cell}} = 1.1 \text{ V}$. (05 Marks)
- c. Emf of the cell $\text{Ag}/\text{AgNO}_3(\text{C}_1) // (\text{C}_2 = 0.2) \text{AgNO}_3/\text{Ag}$ is 0.8 V. Calculate C_1 of the cell. (03 Marks)
- d. What are ion selective electrodes? Discuss the construction of glass electrode and derive an expression relating glass electrode potential and pH. (08 Marks)
- 2 a. Choose your answers for the following : (04 Marks)
- The electrolyte used in alkaline fuel cell is
 A) H_2SO_4 B) KOH
 C) KCL D) NH_4Cl
 - Hydrogen absorbing negative electrode is used in
 A) Ni – Cd – battery B) Ni – MH battery
 C) Li – MnO_2 battery D) Zn – MnO_2 battery
 - In hydrogen – oxygen fuel cell the electrolyte used is
 A) KOH B) H_2SO_4
 C) LiCl D) None of these.
 - In which of the following battery the overall cell reaction is not reversible?
 A) Ni – Cd B) Ni - MH
 C) Pb – Acid D) Zn – MnO_2
- b. What are rechargeable and reserve batteries? (04 Marks)
- c. Explain the construction and working of nickel – metalhydride battery. (06 Marks)
- d. What are fuel cells? Explain the construction and working of methanol oxygen fuel cell. (06 Marks)

- 3 a. Choose your answers for the following : (04 Marks)
- In galvanic corrosion the less active metal always acts as
A) Anode B) Cathode
C) Both anode and cathode D) none of these
 - Caustic embrittlement of boilers is due to presence of excess of
A) Na_2CO_3 B) $\text{Ca}(\text{OH})_2$
C) CaSO_4 D) CaCO_3
 - In differential aeration corrosion the area more accessible to air acts as
A) Cathode B) Anode
C) Anode and Cathode D) None of these
 - Electrolyte used in anodizing of aluminium is
A) H_2SO_4 B) KOH
C) NH_4Cl D) HCl
- b. Explain the following types of corrosion i) Galvanic corrosion ii) Stress corrosion. (06 Marks)
- c. What is anodizing? Explain the anodizing of aluminum. (05 Marks)
- d. What are corrosion inhibitors? Explain how corrosion is controlled by inhibitors. (05 Marks)
- 4 a. Choose your answers for the following : (04 Marks)
- The process in which the metal ions are deposited on catalytically active surface in presence of reducing agent is
A) Electroplating B) Electroless plating
C) Immersion plating D) Electrophoretic painting
 - In electroplating of chromium the anode used is
A) Achromium B) Pb – Sb alloy
C) Nickel D) Copper
 - Concentration of metal ions in plating bath is reduced by addition of
A) Brighteners B) Levellers
C) Complexing agent D) All the above.
 - Reducing agent used in electroless Nickel plating is
A) Formaldehyde B) Sodium Acetate
C) Sodium hypophosphite D) Sodium succinate.
- b. What is electroplating? What are the advantages of electroless plating over electroplating? (04 Marks)
- c. Explain the process of electroless plating of Nickel on aluminum. (06 Marks)
- d. Discuss the chromium plating process. (06 Marks)

PART – B

- 5 a. Choose your answers for the following : (04 Marks)
- Quality of Gasoline is expressed in terms of its
A) Octane number B) Cetane number
C) Compression ratio D) Compression number
 - In fluidized bed catalytic cracking process, the cracking of heavy oil takes place at
A) $200 - 300^\circ\text{C}$ B) $500 - 600^\circ\text{C}$
C) $1000 - 1200^\circ\text{C}$ D) 1500°C
 - Methyl tertiary butyl ether is added to petrol which acts as
A) Inhibitor B) Accelerator
C) Ant knocking agent D) Catalyst
 - Catalysts used in catalytic converter is
A) Pt, Pd and Rh B) Ni, Co and Cr
C) SiO_2 and Al_2O_3 D) Zeolite
- b. What is knocking? Explain its mechanism. (06 Marks)
- c. Explain the construction and working of photovoltaic cell. (04 Marks)
- d. What is biodiesel? Explain the biodiesel production by transesterification of triacylglyceride. (06 Marks)

- 6 a. Choose your answers for the following : (04 Marks)
- In potentiometric redox titrations platinum electrode is used in combination with
 - SHE
 - Calomel electrode
 - NHE
 - None of these
 - Condensed phase rule is applied for a system consisting of :
 - Two component
 - One component
 - Multi component
 - Three component
 - Lambert's law states that intensity of monochromatic light decrease exponentially with
 - Concentration
 - Path length
 - Time
 - Density
 - In flame atomic emission spectroscopy the emitted radiation lies in
 - Visible range
 - IR range
 - UV range
 - None of these
- b. Define the terms phase, component and degree of freedom and explain the application of phase rule to water system. (08 Marks)
- c. What is the principle of flame photometry? What are the processes that occur in the flame? Explain the various components of flame photometer. (08 Marks)
- 7 a. Choose your answers for the following : (04 Marks)
- Addition polymerization is also called
 - Step polymerization
 - Chain polymerization
 - Condensation polymerization
 - none of these
 - Natural rubber is polymerized form of
 - Isoprene
 - Propene
 - Butene
 - Styrene
 - Free radicals are reactive species having
 - Paired electrons
 - Unpaired electrons
 - Anions
 - Cations
 - Glass transition temperature of polymer is
 - First order transition
 - Second order transition
 - Third order transition
 - Multiorder transition
- b. Explain the free radical mechanism of addition polymerization taking ethylene as a monomer. (05 Marks)
- c. Explain the manufacture of plastics by injection moulding process. (05 Marks)
- d. What are polymer composites? Write a note on Kevlar fibre. (06 Marks)
- 8 a. Choose your answers for the following : (04 Marks)
- Temporary hardness of water is due to
 - $\text{Ca}(\text{HCO}_3)_2$ and $\text{Mg}(\text{HCO}_3)_2$
 - CaCl_2
 - CaSO_4
 - MgSO_4
 - Potassium chromate is used as an indicator in analysis of water
 - Hardness
 - Alkalinity
 - Chloride
 - Fluoride
 - Brackish water can be desalinated by
 - Electrodialysis
 - Reverse Osmosis
 - Filtration
 - both A and B
 - The method adopted to analyze dissolved oxygen in water is
 - Volhards
 - Winkers
 - Argentometric
 - Dumas
- b. What is alkalinity of water? Explain the determination of alkalinity of water. (06 Marks)
- c. 20 ml of sample of COD analysis was reacted with 10 ml of 0.25 N $\text{K}_2\text{Cr}_2\text{O}_7$ and the unreacted dichromate required 6.5 ml of 0.10 N Ferrous ammonium sulphate. 10 ml of same $\text{K}_2\text{Cr}_2\text{O}_7$ and 20 ml of distilled water under the same conditions as the sample required 26.0 ml of 0.10 NFAS. What is the COD of the sample? (04 Marks)
- d. What is desalination? Explain the desalination of water by electrodialysis. (06 Marks)