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First/Second Semester B.E. Degree Examination, December 2011
Engineering Chemistry

Time: 3 hrs.

Max. Marks:100

- Note:1. Answer FIVE full questions choosing at least two from each part.**
2. Answer all objective type questions only in OMR sheet page 5 of the Answer Booklet.
3. Answers to objective type questions on sheets other than OMR will not be valued.

PART - A

- 1 a. Choose the correct answer : (04 Marks)
- Which of the following is a fossil fuel?
 (A) Wood (B) Wind (C) Tides (D) Petrol
 - A photovoltaic device, by which, high voltage current can be produced
 (A) cell (B) module (C) panel (D) none of these
 - The efficiency of an IC engine increases as compression ratio
 (A) increases (B) decreases (C) remains constant (D) none of these
 - The petrol fuel is
 (A) solid (B) liquid (C) gas (D) both B & C
- b. Define the terms : i) Octane number ii) Cetane number iii) Knocking. (06 Marks)
- c. What is meant by doping of silicon? Illustrate the vapour phase technique of doping of silicon. (05 Marks)
- d. Calculate the mass of air required for complete combustion of 1kg of coal which has the following % composition : C – 78.5% ; H – 7.5% ; S – 1.0% and remaining is ash. [Atomic mass of C = 12, H = 1, S = 32 and O = 16]. (05 Marks)
- 2 a. Choose the correct answer : (04 Marks)
- Voltmeter in an electrochemical cell is used to measure
 (A) concentration (B) voltage (C) current (D) none of these
 - Calomel electrode produces a potential of ± 0.2422 volt when filled with
 (A) Sat.Kel (B) 1NKel (C) 1MKel (D) 0.1NKel
 - The electrical sign of anode of concentration cell is :
 (A) +ve (B) -ve (C) Neutral (D) none of these
 - A uniform fixed electrical double layer is known as
 (A) Guoy–Chapman (B) Helmholtz (C) Both A & B (D) None of these
- b. Differentiate electrode potential and cell potential, with a suitable example. (04 Marks)
- c. How is the potential of Fe determined experimentally, using calomel electrode? (06 Marks)
- d. Two copper electrodes placed in CuSO_4 solution of equal concentration are connected to form a concentration cell. Write the cell scheme, reaction and calculate the cell voltage. One of the solutions is diluted until the concentration of Cu^{2+} ions is $1/5^{\text{th}}$ of its original volume. What will be the voltage after dilution? (06 Marks)
- 3 a. Choose the correct answer : (04 Marks)
- Lead – acid battery is
 (A) Reserve (B) Re - chargeable (C) Non - chargeable (D) Both A & B
 - The electrolyte used in the $\text{H}_2 - \text{O}_2$ fuel cell is
 (A) Alcoholic KOH (B) Warm KOH soln (C) Sat KOH (D) None of these

- iii) Graphite powder in Ni – Cd battery is used to
 (A) Increase efficiency of the cell (B) Increase the conductivity
 (C) Increase the voltage (D) None of these
- iv) In a dry battery, the graphite rod acts as
 (A) Anode (B) Cathode (C) Both A & B (D) Stabilizer
- b. Explain the construction, working and applications of a Li-MnO₂ battery. (05 Marks)
- c. What are fuel cells? How are they classified? Outline the principle and working of any one fuel cell. (06 Marks)
- d. Discuss the construction and working of Lead – acid battery. (05 Marks)
- 4 a. Choose the correct answer : (04 Marks)
- i) A part of the nail inside the frame undergoes corrosion of the type
 (A) water line (B) stress (C) differential aeration (D) none of these
- ii) A type of corrosion occurs when two different metals are welded and exposed to corrosive environment is
 (A) chemical (B) stress corrosion (C) galvanic (D) pitting
- iii) Impressed current method of preventing corrosion is
 (A) Anodic protection (B) Cathodic protection
 (C) Both A & B (D) None of these
- iv) When the ratio of anodic area to the cathodic area increases, the rate of corrosion
 (A) Decreases (B) Increases (C) attains constancy (D) None of these
- b. Define corrosion. Explain the type of corrosion that occurs when an Fe structure is exposed to atmospheric conditions. (06 Marks)
- c. Account for the following :
- i) Zn in contact with Ag undergoes corrosion faster than Zn in contact with Cu. (03 Marks)
- ii) The hull of a ship suffers from severe corrosion, when partially dipped in sea water. (04 Marks)
- iii) Galvanized sheets are more preferable than tin coated sheets. (03 Marks)

PART - B

- 5 a. Choose the correct answer : (04 Marks)
- i) In electroplating of gold generally, platinum is used as anode because the electrode is
 (A) inert (B) soluble (C) reactive (D) none of these
- ii) In chromium plating, the anode of the metal used is
 (A) Pb (B) Cu (C) Au (D) Cr
- iii) The electrical energy produced due to decrease in free energy of a spontaneous redox reaction, under reversible conditions is
 (A) polarization (B) decomposition (C) overvoltage (D) none of these
- iv) The metal salt concentration in the bath must be kept
 (A) low (B) high (C) medium (D) none of these
- b. Define metal finishing. Mention the technological importance of metal finishing. (05 Marks)
- c. Explain the influence of the following in electroplating :
 i) current density ii) metal ion conc. iii) throwing power (06 Marks)
- d. Discuss the electroplating of gold by cyanide bath. (05 Marks)
- 6 a. Choose the correct answer : (04 Marks)
- i) Thermotropic liquid crystals are those which depend on
 (A) pressure (B) concentration (C) temperature (D) none of these
- ii) The nematic crystals have geometrical shape like
 (A) rod (B) thread (C) plane (D) none of these

- iii) In gravimetric estimation of SO_4^{2-} , one of the following is used as a precipitating agent
 (A) $\text{Ba}(\text{NO}_3)_2$ (B) BaCO_3 (C) BaCl_2 (D) BaSO_4
- iv) The measurement of optical density of light in colorimetric determination of Nitrate involves
 (A) UV range (B) IR range (C) visible (D) All of these
- b. What are thermotropic liquid crystals? What are the phases in which they can exist? (04 Marks)
- c. Explain the applications of liquid crystals in LCD. (04 Marks)
- d. Write a brief note on the following : (08 Marks)
- i) Colorimetric estimation of Cu ii) Potentiometric estimation of FAS. (04 Marks)
- 7 a. Choose the correct answer :
- i) The functionality of $\text{CH}_2 = \text{CH}_2$ is
 (A) one (B) two (C) three (D) four
- ii) The chemical name of natural rubber is
 (A) Isoprene (B) Neoprene (C) Polyisoprene (D) None of these
- iii) Polyacetylene as a conducting polymer when doped with HCl forms
 (A) Oxidative doping (B) Productive (C) Protonic acid (D) None of these
- iv) A polymer containing alternate substituents / groups in the polymer chain will have the geometry called
 (A) Isotactic (B) Syndiotactic (C) Atactic (D) None of these
- b. Define the following terms : i) Monomer ii) Polymer iii) Functionality (05 Marks)
- iv) Degree of polymerization and v) Co-polymer
- c. Describe the production and uses of i) Teflon ii) polyurethane iii) Neoprene (06 Marks)
- d. What are conducting polymers? Write the structure and applications of conducting polyaniline. (05 Marks)
- 8 a. Choose the correct answer : (04 Marks)
- i) Which of the following is potable water?
 (A) Spring (B) River (C) Reservoir (D) None of these
- ii) A treatment involving the removal of phosphate is
 (A) Primary (B) Secondary (C) Tertiary (D) All of these
- iii) Reverse osmosis means flow of solvent molecules from a region of concentration
 (A) Higher to lower (B) Lower to higher
 (C) Both A & B (D) None of these
- iv) The function of HgCl_2 in the estimation of COD is to act as a
 (A) Catalyst (B) Oxidizing agent
 (C) Producing agent (D) Suppressing agent for chlorides
- b. Explain the following :
- i) Determination of fluoride content in water using SPADANS reagent.
 ii) BOD determination in effluent sample by Winkler's method. (12 Marks)
 iii) Purification of water by electro dialysis.
- c. 20cm^3 of sewage sample for COD is reacted with 25cm^3 of $\text{K}_2\text{Cr}_2\text{O}_7$ solution and the unreacted $\text{K}_2\text{Cr}_2\text{O}_7$ requires 9.0cm^3 of N/4 FAS solution. Under similar conditions in blank titration 15.0cm^3 of FAS is used up. Calculate the COD of the sample. (04 Marks)
