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10CHE12/22

First/Second Semester B.E. Degree Examination, June/July 2017

Engineering ~~Physics~~ Chemistry

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing at least two from each part.

PART – A

- 1 a.** Choose the correct answers for the following :
- Calomel electrode produces a potential of ± 0.2422 Volt where filled with
 A) Sat. ku B) 1N ku C) 1 M ku D) 0.1N ku
 - Voltmeter in an electrochemical cell is used to measure
 A) Concentration B) Voltage C) Current D) None of these.
 - Glass electrode cannot be used in the presence of fluoride ions because
 A) Alkaline error B) Loss its activity
 C) Glass membrane dissolves D) None of these
 - The potential of the standard hydrogen electrode is taken as
 A) 1 Volt B) 0 Volt C) 10 Volt D) None of these
 (04 Marks)
- b.** Define single electrode potential. Derive Nerst's equation for single electrode potential
 (06 Marks)
- c.** Define the terms : i) Galvanic cell ii) Concentration cell iii) Reference electrode. Give an example each.
 (06 Marks)
- d.** Calculate the emf of Li-Al cell

$$\text{Li} | \text{Li}^+ (0.12\text{M}) || \text{Al}^{3+} (0.15\text{M}) | \text{Al}$$
 at 298K if the standard reduction potential of lithium electron is -3.05V and aluminium electrode is -1.66V .
 (04 Marks)
- 2 a.** Choose the correct answers for the following :
- The electrolyte used in Li-MnO₂ battery is
 A) 30y. H₂SO₄ B) 60M KOH
 C) Li – halide and organic solvents D) NH₄u + Z_nu₂
 - Which of the following is used in cellular phones?
 A) Zn – MnO₂ B) Zn – Air C) Pb – acid D) Ni – MH
 - The electrolyte used in Zn – Air battery
 A) aq. H₂SO₄ B) aq. KOH C) Con Ku D) None of these
 - Which of the following is a reserve battery?
 A) Zn – Air battery B) Ni – MH battery C) Zn – Ag₂O D) Li – MnO₂
 (04 Marks)
- b.** Describe the construction and working of lead acid battery.
 (06 Marks)
- c.** What are fuel cells? Describe the construction and working of a H₂ – O₂ fuel cell.
 (06 Marks)
- d.** Discuss the battery characteristics: i) Capacity ii) Cycle life.
 (04 Marks)
- 3 a.** Choose the correct answers for the following :
- Impressed current method of preventing corrosion is
 A) Anodic protection B) Cathodic Protection
 C) Both (A) and (B) D) None of these.

Important Note : 1. On completing your answers, compulsorily draw diagonal erase lines on the remaining blank pages.

- ii) Galvanized nuts and bolts is an example of
 A) Cathodic coating B) Impressed current method
 C) Corrosion inhibition D) Anodic coating.
- iii) 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.
- iv) Caustic embrittlement is a classic example of
 A) Differential aeration corrosion B) Stress corrosion
 C) Differential metal corrosion D) None of these. (04 Marks)
- b. Define the term corrosion. Explain the electron chemical theory with reference of iron. (06 Marks)
- c. Explain the following types of corrosion i) Pitting corrosion ii) Water line corrosion. (06 Marks)
- d. Explain the following factors influence on the rate of corrosion
 i) Nature of the corrosion product ii) Hydrogen overvoltage. (04 Marks)
- 4 a. Choose the correct answers for the following :
- i) Throwing power is higher in the case of
 A) Electroplating process B) Electro less plating process
 C) Both (A) and (B) D) None of these.
- ii) Reducing agent used in electro-less plating of copper is
 A) EDTA B) Formaldehyde C) Sodium Hypophosphite D) None of these.
- iii) Gold plating in printed circuit boards is done using
 A) Neural cyanide bath B) Alkaline cyanide bath
 C) Acid cyanide bath D) None of these.
- iv) IN electroplating of chromium the anode used is
 A) Chromium B) Pb-Sb alloy C) Nickel D) Copper. (04 Marks)
- b. Explain the following factors influencing the rate of electro-deposit
 i) Temperature ii) Current density iii) Wetting agent. (06 Marks)
- c. Discuss the process of electroless plating of nickel. Mention its applications (06 Marks)
- d. What is electroplating? Mention any three advantages of electroless plating over electroplating. (04 Marks)

PART – B

- 5 a. Choose the correct answers for the following :
- i) The chemical name of biodiesel is
 A) Monoalkyl fatty ester B) Fatty acids
 C) Triglycerides D) None of these.
- ii) Catalyst used in catalytic converter are
 A) Pt, Pd and Rh B) Ni, Co and Cr C) Al_2O_3 and SiO_2 D) None of these.
- iii) If the percentage of hydrogen in a fuel is, low its net calorific value is
 A) High B) Low C) Constant D) None of these.
- iv) Which of the following is not a secondary fuel
 A) Natural gas B) Coal gas C) Water gas D) Producer gas (04 Marks)
- b. What is meant by cracking? Describe the fluidized bed catalytic cracking process. (06 Marks)
- c. What is PV-cell? Explain the construction and working of PV-Cell. Mention its advantages. (06 Marks)
- d. How much rise in temperature of water occurs when 0.75g of a fuel is burnt a bomb calorimeter containing 2.5kg of water. If the gross calorific values of the fuel is 4500kJ/kg and water equivalent of calorimeter is 0.65kg. Given $S = 4.187 \text{ kJ/kg}^\circ\text{C}$. (04 Marks)

- 6 a. Choose the correct answers for the following :
- In a filtration of strong acid versus strong base conductivity
 - Increases
 - Decreases
 - Increases and then decreases
 - Decreases and then increases.
 - Lambert's law states that intensity of monochromatic light decrease exponentially
 - Concentration
 - Path length
 - Time
 - Density.
 - Flame photometer is based on
 - Atomic absorption
 - Molecular absorption
 - Atomic emission
 - All of above
 - Gibb's phase rule is applicable to
 - Heterogeneous systems
 - Heterogeneous system in equilibrium
 - Homogeneous system
 - All the above
- b. Draw the phase diagram for water system, explain and calculate the number of degree of freedom on a line, in a area and at triple point. (04 Marks)
- c. What are potentiometric titrations? Discuss the application of potentiometry on the estimation of FAS using std $K_2Cr_2O_7$ solution. (06 Marks)
- d. Mention the advantages of conductometric titration. (04 Marks)
- 7 a. Choose the correct answers for the following :
- Which of the following is an adhesive
 - Neoprene
 - Bakelite
 - Plexiglass
 - Araldite
 - The monomer for neoprene is
 - Isoprene
 - Chloroprene
 - Epichlorohydrin
 - Bisphenol – A.
 - Kelvar is a
 - Polyurethanes
 - Polycarbonates
 - Polystyrene
 - Polyamide.
 - Benzoyl peroxide is used as
 - Inhibitor
 - Terminator
 - Propagator
 - Chain transfer agent
- b. Define glass transition temperature. Explain the following factors affecting Tg. Value. (06 Marks)
- Flexibility
 - Molecular weight.
- c. What are conducting polymers? Explain the mechanism of conduction poly acetylene by oxidative doping (P-type). (06 Marks)
- d. How are the following polymers synthesized i) Teflon ii) PMMA. (04 Marks)
- 8 a. Choose the correct answers for the following :
- Complexing agent for spectrochemical analysis of nitrates
 - SPADNA
 - Ammonia
 - Phenol sulphonic acid
 - Phenol disulphonic acid
 - A treatment involving the removal of phosphate is
 - Primary
 - Secondary
 - Tertiary
 - None of these.
 - The indicator used in the determination of chloride content of water sample by Mohr's method.
 - Phenolphthalein
 - Potassium chromate
 - Starch
 - Ferroin
 - Permanent hardness of water is caused due to the presence of
 - Calcium carbonate
 - Calcium chloride
 - Calcium bicarbonate
 - All the above.
- b. Explain the gravimetric method of determination of sulphate content in water. (06 Marks)
- c. What is desalination? Explain the desalination of water by reverse osmosis. (06 Marks)
- d. Explain the activated sludge process. (04 Marks)

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