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14CHE12/22

**First/Second Semester B.E. Degree Examination, Dec.2016/Jan.2017**  
**Engineering Chemistry**

Time: 3 hrs.

Max. Marks: 100

**Note: Answer FIVE full questions, selecting  
ONE full question from each module.**

**Module-1**

- 1 a. Define ion selective electrode. Explain the principle and construction of glass electrode. (05 Marks)
- b. Describe the construction and working of Ni-metal hydride battery. Write its application. (05 Marks)
- c. Define concentration cell. The spontaneous cell  $\text{Sn}|\text{Sn}^{2+} (0.024 \text{ M})||\text{Sn}^{2+} (0.064)|\text{Sn}$  at  $25^\circ\text{C}$ . Calculate the emf of the cell and cell reactions. (05 Marks)
- d. Explain the following battery characteristics:
  - i) Voltage,
  - ii) Energy efficiency,
  - iii) Cycle life (05 Marks)
- 2 a. Derive Nernst's equation for single electrode potential. (05 Marks)
- b. Define fuel cell. Explain the construction and working of Lithium  $\text{MnO}_2$  cell. Write its application. (05 Marks)
- c. What are secondary reference electrodes? Explain the construction and working of Calomel Electrode. (05 Marks)
- d. Explain the construction and working of Methanol Oxygen fuel cell. (05 Marks)

**Module-2**

- 3 a. Explain the following corrosion types:
  - i) Differential metal corrosion, (05 Marks)
  - ii) Differential aeration corrosion. (05 Marks)
- b. Define electroplating. Write technological importance of metal finishing (05 Marks)
- c. What is anodic metal coating? Explain the process of Galvanizing. (05 Marks)
- d. Describe the electroplating of chromium. (05 Marks)
- 4 a. Explain the electrochemical theory of rusting of iron. (05 Marks)
- b. Discuss the electroless plating of copper with reactions. (05 Marks)
- c. Explain the factors affecting the rate of corrosion:
  - i) Nature of corrosion product
  - ii) pH (05 Marks)
- d. Discuss the following principles of metal finishing:
  - i) Decomposition potential
  - ii) Over voltage. (05 Marks)

**Module-3**

- 5 a. Define calorific value of a fuel. Explain the calorific value of solid fuel by determination by bomb calorimeter. (05 Marks)
- b. Define photovoltaic cell. Explain construction and working of PV cell. (05 Marks)
- c. Explain the synthesis of petrol by Fischer-Tropsch process. (05 Marks)
- d. Explain the purification of Silicon by zone refining process. (05 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.

- 6 a. Define cracking. Explain the process of fluidized bed catalytic process cracking with neat diagram. (05 Marks)
- b. Discuss the production of solar grade Silicon by Union Carbide process. (05 Marks)
- c. Write a short note on power alcohol and knocking in petrol engine. (05 Marks)
- d. Define doping. Write two physical and two chemical properties of silicon. (05 Marks)

#### Module-4

- 7 a. Define polymer. Explain the addition and condensations polymerization with examples. (05 Marks)
- b. Discuss the synthesis and application of Silicon rubber and polyurethane. (05 Marks)
- c. Explain any two structures and property of relations of polymers. (05 Marks)
- d. Write the mechanism of conduction in polyaniline. (05 Marks)
- 8 a. Explain free radical mechanism of addition polymerization by taking Vinyl Chloride as an example. (05 Marks)
- b. Explain the synthesis and applications of (i) plexi-glass, (ii) Teflon. (05 Marks)
- c. Discuss the factors influencing the  $T_g$ :
- i) Flexibility
- ii) Branching and cross linking. (05 Marks)
- d. What are conducting polymers? Write synthesis properties of Carbon fibres. (05 Marks)

#### Module-5

- 9 a. How scales and sludges are formed in boilers and write its disadvantages. (05 Marks)
- b. What are nanoscale materials? Explain synthesis of nanomaterials by chemical vapour condensation method. (05 Marks)
- c. What is desalination of water? Explain the desalination of sea water by reverse osmosis. (05 Marks)
- d. Write a note on size dependent properties of nanomaterials. (05 Marks)
- 10 a. Write a note on secondary sewage treatment method. (05 Marks)
- b. Write an account on carbon nanotubes. (05 Marks)
- c. Define fullerenes. Explain hydrothermal synthesis of nanomaterials. (05 Marks)
- d.  $25 \text{ cm}^3$  of an effluent sample requires for oxidation of  $8 \text{ cm}^3$  of  $0.001\text{M K}_2\text{Cr}_2\text{O}_7$ . Calculate the COD of the effluent sample. (05 Marks)

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