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 $Sn|Sn^{2+}$ (0.024 M)$||Sn^{2+}$(0.064)$|Sn$ at 25°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 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,
     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)

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 cm^3 of an effluent sample requires for oxidation of 8 cm^3 of 0.001M $K_2Cr_2O_7$. Calculate the COD of the effluent sample. (05 Marks)

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