# CBCS Scheme

USN ☐☐☐☐☐☐☐☐☐☐

15CHE12/22

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

Time: 3 hrs.

Max. Marks: 80

**Note:** *Answer FIVE full questions, choosing one full question from each module.*

### Module-1

1  a. Describe the construction and working of Li-MnO$_2$ battery. **(05 Marks)**
   b. Define battery. Explain the following battery characteristics:
      (i)   Electricity storage density.
      (ii)  Energy efficiency.
      (iii) Cycle life.
      (iv)  Shelf life. **(05 Marks)**
   c. Define reference electrode. Explain the construction and working of Calomel electrode. **(06 Marks)**

### OR

2  a. A concentration cell was constructed by immersing two silver electrodes in 0.02 M and 2 M AgNO$_3$ solution. Write the cell representation, cell reactions and calculate the EMF of the cell at 25°C. **(05 Marks)**
   b. Derive Nernst equation for single electrode potential. **(05 Marks)**
   c. Explain the construction and working of methanol oxygen fuel cell. Mention its application. **(06 Marks)**

### Module-2

3  a. What is cathodic protection? Explain how a metal article is protected by sacrificial anodic method. **(05 Marks)**
   b. Explain the following factors affecting the rate of corrosion:
      (i)   Nature of the metal.
      (ii)  Ratio of anodic to cathodic areas.
      (iii) pH. **(05 Marks)**
   c. Explain electroless plating of copper with relevant reaction. **(06 Marks)**

### OR

4  a. What is metal finishing? Give the technological importance of metal finishing. **(05 Marks)**
   b. Explain the influence of the following factors on the nature of electrodeposit:
      (i)   pH.
      (ii)  Temperature.
      (iii) Concentration of the metal ion. **(05 Marks)**
   c. Explain stress and differential metal corrosion with example. **(06 Marks)**

### Module-3

5  a. Define cracking. Describe fluidized bed catalytic cracking. **(05 Marks)**
   b. What is biodiesel? Explain the synthesis and advantages of biodiesel. **(05 Marks)**
   c. Explain the production of solar grade silicon by union-carbide process. **(06 Marks)**

**OR**

6  a.  Define photo voltaic cell. Explain the construction and working of photo voltaic cell.
(06 Marks)

b.  Explain the purification of silicon by zone refining.  (04 Marks)

c.  A 0.6 g of coal sample (carbon 90%, $H_2$ 3% and ash 7%) was subjected to combustion in a bomb calorimeter. Mass of water taken in the calorimeter was 2000 g and the water equivalent of calorimeter was 400 g. The rise in temperature was 3°C. Calculate the gross and net calorific value of the sample. Given, specific heat of water is 4.187 KJ/kg/°C and latent heat of steam is 2454 KJ/kg.  (06 Marks)

## Module-4

7  a.  Explain the free radical mechanism for addition polymerization by taking vinyl chloride as an example.  (06 Marks)

b.  Explain the synthesis, properties and applications of epoxy resin.  (04 Marks)

c.  What is glass transition temperature? Explain the following factors affecting glass transition temperature.
(i)  Chain flexibility and
(ii)  Intermolecular forces.  (06 Marks)

**OR**

8  a.  Explain structure – property relationship of polymers with respect to,
(i)  Crystallinity  (ii)  Tensile strength  (05 Marks)

b.  What is polymerization? Explain addition and condensation polymerization with example.  (05 Marks)

c.  What are polymer composite? Explain the synthesis, properties and application of Kevlar fibre.  (06 Marks)

## Module-5

9  a.  Write a note on fullerenes. Mention its application.  (05 Marks)

b.  Discuss the synthesis of nanomaterials by gas condensation method and chemical vapour condensation processes.  (05 Marks)

c.  Discuss the experimental determination of Dissolved Oxygen (DO) of waste water. Mention the reactions involved in it.  (06 Marks)

**OR**

10  a.  What is desalination? Discuss the desalination of sea water by ion exchange process.  (05 Marks)

b.  What is boiler feed water? Explain the scale and sludge formation in boilers.  (05 Marks)

c.  Explain any three size dependent properties of nanomaterials.  (06 Marks)

* * * * *