USN ⬚⬚⬚⬚⬚⬚⬚⬚⬚⬚ **17CHE12/22**

First/Second Semester B.E. Degree Examination, Aug./Sept.2020
Engineering Chemistry

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1   a. Define Single Electrode Potential. Derive the Nernst equation for single electrode. **(07 Marks)**
     b. What are reference electrodes? Describe the construction and working of glass electrode. Mention the uses. **(07 Marks)**
     c. Define fuel cells. Explain the difference between battery and fuel cell. **(06 Marks)**

OR

2   a. What are concentration cells? An electrolyte concentration cell consists of two magnesium electrodes immersed in magnesium nitrate solutions of 0.024 M and 0.064M concentration at 25°C. Give the cell representation, cell reaction and calculate the emf of the cell. **(07 Marks)**
     b. Describe he construction and working of lithium ion battery. Mention the uses. **(07 Marks)**
     c. Write a note on (i) Voltage   (ii) Cycle life   (iii) Shelf life. **(06 Marks)**

Module-2

3   a. What is galvanization? Explain galvanization process by hot dipping? Mention uses. **(07 Marks)**
     b. Define Electroless Plating. Explain electroless plating of copper with relevant reactions. **(07 Marks)**
     c. Explain the following factors affecting rate of corrosion :
        (i) Nature of the metal   (ii) Ratio of anodic and cathodic area   (iii) pH **(06 Marks)**

OR

4   a. Define corrosion. Explain the electrochemical theory of corrosion by taking Iron as an example. **(07 Marks)**
     b. Define electroplating? Explain the electroplating of chromium. Mention the uses. **(07 Marks)**
     c. Define Metal Finishing? Give the technological importance of metal finishing. **(06 Marks)**

Module-3

5   a. What is cracking? Explain fluidized catalytic cracking process. **(07 Marks)**
     b. 0.85g of coal sample (Carbon = 90%, H_2 = 5% and ash = 5%) was subjected to combustion in a bomb calorimeter. Mass of water taken in the calorimeter was 2000g and the water equivalent of the calorimeter was 600g. The rise in temperature was found to be 3.5°C. Calculate the gross and net calorific values of the sample.
        (Latent heat of steam = 2454 kJ kg^{-1}, Specific heat of water = 4.2 kJ kg^{-1} $°C^{-1}$) **(07 Marks)**
     c. Explain the purification of Silicon by zone refining process. **(06 Marks)**

OR

6   a. Define calorific value of fuel? Explain the experimental determination of calorific value of a solid fuel using Bomb Calorimeter. **(07 Marks)**
     b. Describe the synthesis of petrol by Fishcer – Tropsch process. **(07 Marks)**
     c. Explain the construction and working of Photovoltaic Cell. **(06 Marks)**

Module-4

7 a. Define Polymers. Differentiate between Addition and Condensation polymerization.

             (07 Marks)

   b. Explain the free radical mechanism of addition polymerization of by taking vinyl chloride as an example.   (07 Marks)

   c. Explain the synthesis and applications of (i) Polyurethanes (ii) Polycarbonates.   (06 Marks)

OR

8 a. In a sample of a polymer, 100 molecules have molecular mass 10^3 g/mol, 250 molecules have molecular mass 10^4 g/mol and 300 molecules have molecular mass 10^5 g/mol. Calculate the number average and weight average molecular mass of the polymer.

             (07 Marks)

   b. Define Glass transition temperature? Explain any three factors affecting glass transition temperature.   (07 Marks)

   c. Give the synthesis and applications of (i) Kevlar (ii) Epoxy resin.   (06 Marks)

Module-5

9 a. What is boiler corrosion? Explain with reactions.   (07 Marks)

   b. What is desalination? Explain desalination of seawater by Reverse Osmosis process.

             (07 Marks)

   c. What are nano materials? Explain the synthesis of nano materials by Sol-gel method.

             (06 Marks)

OR

10 a. Define COD and BOD. In a COD test 20.5 cm^3 and 10.5 cm^3 of 0.01 N FAS solution are required for blank and sample titration respectively. The volume of test sample used is 25 cm^3. Calculate the COD of the sample.   (07 Marks)

   b. Explain any three size dependent properties of nanomaterials.   (07 Marks)

   c. Write short notes on :
     (i) Fullerenes
     (ii) Carbon nano rods.   (06 Marks)

* * * * *