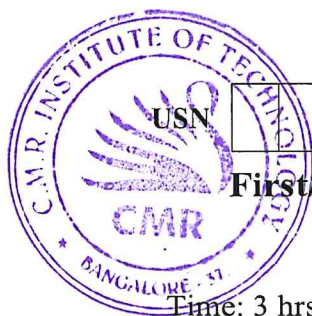USN | | | | | | | | |

21CHE12/22

First/Second Semester B.E. Degree Examination, July/August 2022
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 Nernst equation for Single Electrode Potential.
(07 Marks)
   b. Explain the construction and working of glass electrode. (07 Marks)
   c. Describe the construction and working of lithium ion battery. Mention its applications.
(06 Marks)

OR

2 a. What are Reference Electrodes? Discuss the construction and working of Calomel electrode.
(07 Marks)
   b. Calculate the single electrode potential of copper electrode at 28°C. Given that standard electrode potential of Cu is 0.34V and concentration of Cu^{2+} ions is 0.012m. (07 Marks)
   c. Distinguish between Primary , Secondary and Reserve batteries. (06 Marks)

Module-2

3 a. Explain the following factors which affect the rate of corrosion :
      i) Ratio of Anodic and Cathodic area   ii) Nature of corrosion product. (07 Marks)
   b. What is Electroless Plating? Distinguish between Electroplating and Electroless plating.
(07 Marks)
   c. Describe differential Metal corrosion and Water line corrosion. (06 Marks)

OR

4 a. Explain Sacrificial anode and Impressed current method of corrosion control. (07 Marks)
   b. What is meant by Metal finishing? Mention technological importance of Metal finishing.
(07 Marks)
   c. A steel sheet area $400cm^3$ ($62 in^2$) is exposed to moist air. After one year period it was found to experience a weight loss of 375g due to corrosion. If the density of steel is 7.9 g/cm^3, calculate the CPR in mpy and mmy^{-1}. Given that K = 534 in mpy and 87.6 in mmy^{-1}.
(06 Marks)

Module-3

5 a. What are Polymer Composites? Explain the synthesis , properties and applications of Kevlar. (07 Marks)
   b. Describe the mechanism of conduction in Polyaniline. (07 Marks)
   c. Discuss the properties and applications of Carbon nanotubes. (06 Marks)

OR

6 a. Explain the synthesis , properties and application of Polymethane. (07 Marks)
   b. What are Biodegradable polymers? Explain the synthesis , properties and applications of Polylactic acid. (07 Marks)
   c. What are Nanomaterials? Describe the synthesis of Nano materials by Sol – Gel process.
(06 Marks)

Module-4

7 a. Define Green chemistry. Briefly explain basic principles of Green chemistry. **(07 Marks)**

b. Discuss the synthesis of Adipic acid by conventional route from benzene and green route from glucose. **(07 Marks)**

c. Describe the construction and working of Methanol – Oxygen fuel cell. **(06 Marks)**

OR

8 a. Explain the synthesis of Paracetamol by conventional and green route from phenol. **(07 Marks)**

b. Describe the production of hydrogen by photocatalytic water Splitting method. **(07 Marks)**

c. Explain the construction and working of Photovoltaic cell. **(06 Marks)**

Module-5

9 a. Explain the Theory , Instrumentation and Applications of Colorimetry. **(07 Marks)**

b. Discuss the determination of hardness of water by EDTA method. **(07 Marks)**

c. Define the following terms :
   i) Normality   ii) Molarity   iii) Mole fraction. **(06 Marks)**

OR

10 a. Explain the theory and any two applications of Conductometric Analysis. **(07 Marks)**

b. In a COD experiment, 24.8 and 16.6cm3 of 0.2N FAS solutions are required for blank and sample titration respectively. The volume of test sample used was $25cm^3$. Calculate COD of the sample solution. **(07 Marks)**

c. What are Primary and Secondary standards? Explain the requirements of Primary Standard solution. **(06 Marks)**

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