

# CBCS SCHEME

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17CHE12/22

## 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. What is single electrode potential? Derive Nernst equation for electrode potential. (07 Marks)
- b. What are concentration cells? Calculate the emf of the following concentration cell at 298 K consisting of zinc electrodes immersed in a solution of zinc ions 2.5 m and 0.05 m concentrations. Write cell notation and electrode reactions. (07 Marks)
- c. Write the cell reactions, construction and working principle of Zin-Air battery. Mention its applications. (06 Marks)

**OR**

- 2 a. What are batteries? Explain construction and working principle of Li-MnO<sub>2</sub> battery. Mention its applications. (07 Marks)
- b. What are Fuel cells? Describe construction and working of Methanol-oxygen Fuel-cell. (07 Marks)
- c. What are reference electrodes? Explain construction and working Calomel electrode. (06 Marks)

### Module-2

- 3 a. What is Corrosion? Explain electrochemical theory of corrosion. (07 Marks)
- b. Define differential metal corrosion. Explain differential metal corrosion with examples. (07 Marks)
- c. What is metal finishing? Write any four technological importances of metal finishing. (06 Marks)

**OR**

- 4 a. What is electroplating? Give an account of electroplating Nickel by Watts-Bath. (07 Marks)
- b. What is electroless plating? Describe electroless plating of copper in PCB. (07 Marks)
- c. What is cathodic protection? Explain sacrificial anodic method. (06 Marks)

### Module-3

- 5 a. What are chemical fuels? Give the classification of fuels with examples. (07 Marks)
- b. Define calorific value of a fuel. A coal sample with 93% C, 5% H<sub>2</sub> and 2% ash is subjected to combustion in a bomb calorimeter. Calculate the gross and net calorific value given that mass of coal sample taken is 0.95 g, mass of water in calorimeter is 2000 g, water equivalent of calorimeter is 700 g, rise in temperature of water is 2.8°C. Latent heat of steam is 2457 KJ/kg and specific heat of water is 4.187 kJ/kg/°C (07 Marks)
- c. Write a brief note on module, panels and array of photovoltaic cell. (06 Marks)

**OR**

- 6 a. What are solar cells? With neat diagram, explain the construction and working of photovoltaic cell. (07 Marks)  
b. Explain production of solar grade silicon by union-carbide method. (07 Marks)  
c. What is cracking? Explain fluidized bed catalytic cracking process. (06 Marks)

**Module-4**

- 7 a. What is polymerization? Explain free radical mechanism of addition polymerization taking polyvinyl chloride as example. (07 Marks)  
b. What is number average molecular mass? A polymer sample contains 5 molecules having a molecular weight of 2000 g/mol, 4 molecules having a molecular weight of 3000 g/mol and 3 molecules having a molecular weight of 4000 g/mol. Calculate number average ( $\bar{M}_n$ ) and weight average molecular mass ( $\bar{M}_w$ ). (07 Marks)  
c. Explain synthesis and applications of,  
(i) Poly methyl metha acrylate and  
(ii) Poly urathane. (06 Marks)

**OR**

- 8 a. What are conducting polymers? Explain mechanism of conducting in polyaniline. (07 Marks)  
b. What is silicon rubber? Explain synthesis, properties and applications of polymethyl siloxane. (07 Marks)  
c. What is Epoxy group? Explain the synthesis and applications of Epoxy resin. (06 Marks)

**Module-5**

- 9 a. What are boiler scales? Explain formation of boiler scales and its disadvantages. (07 Marks)  
b. What is COD? In a COD test 28.1 cm<sup>3</sup> and 14.0 cm<sup>3</sup> of 0.05 N FAS solution were required for blank and sample titration respectively. The volume of test sample used is 25 cm<sup>3</sup>. Calculate COD of the sample. (07 Marks)  
c. Explain any three size dependent properties of nano materials. (06 Marks)

**OR**

- 10 a. What is softening of water? Explain ion exchange process with neat diagram. (07 Marks)  
b. What is bottom up approach for synthesis of nano materials? Explain Sol-gel method of synthesis of nano materials. (07 Marks)  
c. Explain with neat diagram Carbon Nano Tubes (CNT's) and Fullerenes. (06 Marks)

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