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18CHE12/22

First/Second Semester B.E. Degree Examination, Feb./Mar. 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. Derive an expression for single electrode potential. (07 Marks)
- b. What are concentration cell? A concentration cell was constructed by immersing two copper rods in CuSO_4 solution of concentration 0.02 M and 0.3 M respectively. Write the cell representation, cell reaction and calculate the emf of the cell at 25°C . (07 Marks)
- c. Explain the construction and working of Li - ion battery. (06 Marks)

OR

- 2 a. With a neat sketch explain the construction and working of calomel electrode. Write its advantages and application. (07 Marks)
- b. Explain the construction and working of Ni-MH battery. Write any two applications. (07 Marks)
- c. What are ion selective electrodes? Explain the construction and working of glass electrode. (06 Marks)

Module-2

- 3 a. What is corrosion? Explain electrochemical theory of corrosion. (07 Marks)
- b. Explain Bimetallic and Pitting corrosion. (07 Marks)
- c. What is Electroless plating? Explain Electroless plating of Nickel. (06 Marks)

OR

- 4 a. Explain Polarization and Decomposition potential. (07 Marks)
- b. What is electroplating? Explain electroplating of Hard and Decorative Chromium. (07 Marks)
- c. What is Galvanization? Explain galvanization process of Zn. (06 Marks)

Module-3

- 5 a. Define calorific value. Explain the determination of calorific value of a solid fuel by Bomb calorimeter. (07 Marks)
- b. On burning 0.87 g of coal sample in a bomb calorimeter the temperature of water rise to 4.8°C . The mass of water in the calorimeter and water equivalent of calorimeter is 3800 g and 430 g and % of H_2 in the coal sample is 4.7, calculate GCV and NCV. (Given: Specific heat of water $4.18 \text{ kJ/kg}^\circ\text{C}$, latent heat of steam 2454 kJ/kg). (07 Marks)
- c. What is PV cell? Explain the construction and working of PV cell. (06 Marks)

OR

- 6 a. What are fuel cells? Explain the construction and working of MeOH/O_2 fuel cell. (07 Marks)
- b. What is meant by knocking? Explain the mechanism of knocking and write its ill effects. (07 Marks)
- c. Write a note on Bio-Diesel. (06 Marks)

Module-4

- 7 a. What are the sources of ozone depletion? What are its effects, how it is controlled? (07 Marks)
b. Mention the sources of solid waste and explain any two methods of disposal solid waste. (07 Marks)
c. What is boiler feed water? Explain the mechanism of formation of sales and sludges. What are its disadvantages? (06 Marks)

OR

- 8 a. Define COD? Explain the experimental determination of COD. (07 Marks)
b. In a COD test 28.9 cm³ and 13.3 cm³ of 0.05N FAS solution was required for blank and sample titration respectively. The volume of the test sample used was 25 cm³. Calculate the COD sample. (07 Marks)
c. Explain the sewage treatment by activated sludge process. (06 Marks)

Module-5

- 9 a. Explain the theory and instrumentation of Potentiometry. (07 Marks)
b. Explain the theory and instrumentation of Conductometry and plot graph for Strong acid vs Strong base → Weak acid vs Strong base. (07 Marks)
c. Explain the synthesis of nano materials by sol-gel process. (06 Marks)

OR

- 10 a. Write the synthesis of nano materials by chemical vapour deposition technique. (07 Marks)
b. Write a note on CNT and Fullerenes. (07 Marks)
c. Explain the theory and instrumentation of calorimetry by taking Cu as an example. (06 Marks)
