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First/Second Semester B.E. Degree Examination, Dec.2018/Jan.2019 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 are ion selective electrodes? Discuss the construction and working of a glass electrode. (07 Marks)
- b. Define Battery. Explain construction, working and uses of (Ni – Metal Hydride) battery. (07 Marks)
- c. What are fuel cells? How it is different from a galvanic cell? Mention any two advantages of fuel cell. (06 Marks)

OR

- 2 a. Derive Nernst equation for electrode potential. (06 Marks)
- b. What are concentration cells? The emf of the cell
 $\text{Ag} | \text{AgNO}_3 (0.0083\text{M}) || \text{AgNO}_3 (\text{X}\text{M}) | \text{Ag}$
was found to be 0.074 V at 298 K. Calculate the value of X and write the cell reactions. (07 Marks)
- c. Describe the construction, working and applications of methanol –oxygen fuel cell. (07 Marks)

Module-2

- 3 a. Define corrosion. Explain electrochemical theory of corrosion by taking Iron as an example. (07 Marks)
- b. What is Cathodic protection? Explain Sacrificial Anode and Impressed Current method for prevention of corrosion. (07 Marks)
- c. Define electroless plating. What are the differences between electroplating and electroless plating? (06 Marks)

OR

- 4 a. How does the following factors affect the rate of corrosion?
(i) Nature of the corrosion product
(ii) Temperature
(iii) pH. (06 Marks)
- b. Explain the process of electroplating of chromium and its applications. (07 Marks)
- c. Discuss the process of electroless plating of copper and explain its application in the manufacture of Printed Circuit Board (PCB). (07 Marks)

Module-3

- 5 a. Define Gross and Net calorific values of a solid on a liquid fuel. Calculate the gross and net calorific value of a sample of coal 0.5 g of which when burnt in a bomb calorimeter raised the temperature of water from 293 K to 296.4 K. The mass of water is 1000 g and water equivalent of calorimeter is 350 g. The specific heat of H₂O is 4.187 kJ/kg/K, latent heat of steam is 2454 kJ/kg. The coal sample contains 93% carbon, 5% hydrogen and 2% ash. (07 Marks)

- b. What is meant by knocking? What are its ill effects? Discuss the mechanism of knocking by giving relevant equations. (07 Marks)
- c. Explain the construction and working of a PV cell. (06 Marks)

OR

- 6 a. What is cracking of petroleum? Describe the fluidized bed catalytic cracking. (07 Marks)
- b. Explain the production of solar grade silicone by Union Carbide process. (07 Marks)
- c. Write a note on : (06 Marks)
- (i) Power alcohol (ii) Biodiesel.

Module-4

- 7 a. What is addition polymerization? Illustrate the mechanism of addition polymerization by taking Vinyl Chloride as an example. (07 Marks)
- b. Describe the manufacture of (i) PMMA (ii) Epoxy resin. Mention the uses. (07 Marks)
- c. A polymer sample containing 100, 250 and 300 molecules having molar mass 10^3 g/mol, 10^4 g/mol and 10^5 g/mol respectively. Calculate the number average and weight average molecular mass of polymer. (06 Marks)

OR

- 8 a. What is glass transition temperature? Explain any three factors affecting T_g . (07 Marks)
- b. What are elastomers? Give the synthesis and applications of (i) Silicone rubber (ii) Polycarbonate. (07 Marks)
- c. What are conducting polymers? Discuss the conduction mechanism in polyaniline. (06 Marks)

Module-5

- 9 a. Define Priming and Foaming. Mention the reasons for priming and foaming in the boiler with any two prevention steps. (07 Marks)
- b. What is desalination? Explain the desalination of water by reverse osmosis. (06 Marks)
- c. Describe the synthesis of nano-materials by Sol-gel process. (07 Marks)

OR

- 10 a. Define COD. In COD test 25.5 cm^3 and 12.5 cm^3 of 0.05N FAS solution and required for blank and sample titration respectively. The volume of the test sample used is 25 cm^3 . Calculate the COD of the sample solution. (07 Marks)
- b. Explain the precipitation method for preparation of nanomaterials with an example. (07 Marks)
- c. Write a note on Fullerenes and Composites. (06 Marks)

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