USN | | | | | | | | | | |

14CHE12/22

First/Second Semester B.E. Degree Examination, Dec.2017/Jan.2018
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 reference electrodes? Describe the construction and working of calomel electrode. **(05 Marks)**

b. What is an electrolyte concentration cell? Derive an expression for its cell potential. **(05 Marks)**

c. Explain the following battery characteristics : i) Cell potential ii) Capacity iii) Electricity storage density. **(06 Marks)**

d. Explain the construction and working of methanol – oxygen fuel cell with a neat sketch. **(04 Marks**

OR

2 a. Derive Nernst equation for electrode polished. **(05 Marks)**

b. How pH of a given solution is determined using glass electrode? **(05 Marks)**

c. Discuss the construction, working and applications of Nickel – Metal hydride battery. **(05 Marks)**

d. What are lithium ion batteries? Describe the construction and working of lithium ion battery. **(05 Marks)**

Module-2

3 a. Define corrosion. Discuss electrochemical theory of corrosion. **(05 Marks)**

b. Discuss corrosion control by cathodic protection with reference to sacrificial anode method. **(05 Marks)**

c. Discuss the following factors which influence the nature of electro-deposit :
i) Current density ii) Temperature iii) pH. **(06 Marks)**

d. Explain electroplating of decorative chromium. **(04 Marks)**

OR

4 a. Discuss the following factors affecting the rate of corrosion :
i) Nature of corrosion product ii) ratio of anodic to cathodic area iii) polarization of anodic and cathodic regions. **(06 Marks)**

b. Write a note on Tinning. **(04 Marks)**

c. What is metal finishing? Mention technological importance of metal finishing. **(04 Marks)**

d. Explain electroless plating of copper and the manufacturing double sided PCVs with copper. **(06 Marks)**

Module-3

5 a. What is calorific value of a fuel? Discuss the determination of calorific value of a solid fuel using bomb calorimeter with neat sketch. **(06 Marks)**

b. Discuss the synthesis of petrol by Fischer – Tropsch process. **(04 Marks)**

c. Write a note on : i) power alcohol ii) biogas. **(04 Marks)**

d. What are the advantages and disadvantages of PV cells? Explain the production of solar grade silicon by union carbide process. **(06 Marks)**

OR

6 a. 0.73g of coal sample (%H = 5.0) was subjected to combustion in Bombs calorimeter. Mass of water taken in calorimeter was 1500g and water equivalent of calorimeter 470g. Initial temperature of water was 25°C and final temperature 27.3°C. Calculate GCV and NCV of coal sample. (Latent heat of steam 2454kJ/kg and specific heat of water = 4.187 kJ kg^{-1} k^{-1}). **(06 Marks)**

b. What is meant by petroleum cracking? Describe fluidized catalytic cracking process. **(04 Marks)**

c. Write a note on : i) octane number ii) biodiesel. **(04 Marks)**

d. What are photovoltaic cells? Explain construction and working of PV cell. **(06 Marks)**

Module-4

7 a. Define polymerization. Explain free radical mechanism for the formation of polyvinyl chloride. **(06 Marks)**

b. What is glass transition temperature? Discuss any three factors that influence Tg. **(04 Marks)**

c. Give the synthesis and application of : i) polyurethane and ii) polycarbonate. **(05 Marks)**

d. What are conducting polymers? Explain mechanism of conduction in polyaniline. **(05 Marks)**

OR

8 a. Calculate number average and weight average molecular weight of polypropylene with following composition (Given atomic masses of C = 12, H = 1)

$[CH_2 - \underset{\displaystyle CH_3}{\underset{|}{CH}}]_{120}$ 25% ; $[CH_2 - \underset{\displaystyle CH_3}{\underset{|}{CH}}]_{60}$ 35% ; $[CH_2 - \underset{\displaystyle CH_3}{\underset{|}{CH}}]_{150}$ 40%. **(05 Marks)**

b. How are structure property relationship of polymers related to crystalline and tensile strength? **(05 Marks)**

c. Give the synthesis and application of : i) Silicone rubber and ii) epoxy resion. **(05 Marks)**

d. What are polymer composites? Give the synthesis of carbon fiber. **(05 Marks)**

Module-5

9 a. Discuss boiler troubles with respect to scale and sludge formation. **(05 Marks)**

b. Explain softening of water by ion exchange process. **(05 Marks)**

c. How do you synthesize nano materials by i) precipitation method ii) chemical vapour condensation. **(06 Marks)**

d. Write a note on nano wires. **(04 Marks)**

OR

10 a. Discuss boiler trouble with respect to priming and teaming. **(05 Marks)**

b. What is sewage? Discuss the activated sludge process of sewage treatment. **(05 Marks)**

c. How do you synthesis nano materials by i) Sol –gel process ii) gas condensation method. **(06 Marks)**

d. Write a note on nano composites. **(04 Marks)**

* * * * *