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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 : (06 Marks)
i) Current density ii) Temperature iii) pH. (04 Marks)
- d. Explain electroplating of decorative chromium. (04 Marks)

OR

- 4 a. Discuss the following factors affecting the rate of corrosion : (06 Marks)
i) Nature of corrosion product ii) ratio of anodic to cathodic area iii) polarization of anodic and cathodic regions. (04 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 PCBs 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)

important note : 1. Candidates must answer questions in appropriate order. 2. Any revealing of identification, appeal to evaluator and not equating marks of 100. 3. Candidates must draw diagonal cross lines on the remaining blank pages.

OR

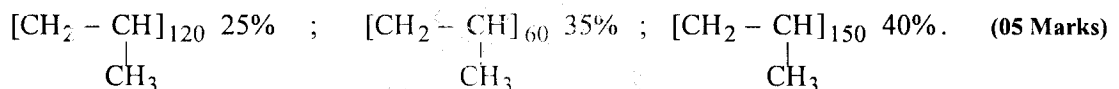
- 6 a. 0.73g of coal sample (%H = 5.0) was subjected to combustion in Bombs calorimeter. Mass of water taken in calorimeter was 1500g and water equivalent of calorimeter 470g. Initial temperature of water was 25°C and final temperature 27.3°C. Calculate GCV and NCV of coal sample. (Latent heat of steam 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 T_g. (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)



- 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 resin. (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 synthesize nano materials by i) Sol-gel process ii) gas condensation method. (06 Marks)
- d. Write a note on nano composites. (04 Marks)

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