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14CHE12/22

First/Second Semester B.E. Degree Examination, June/July 2017
Engineering Chemistry

Time: 3 hrs.

Max. Marks:100

Note: Answer FIVE full questions, selecting ONE full question from each module.

Module – 1

- 1
 - a. Derive Nernst equation for single electrode potential. (05 Marks)
 - b. What is reference electrode? Discuss the construction and working of Calomel electrode. (05 Marks)
 - c. Explain the following characteristics of battery,
 - (i) Cell potential
 - (ii) Capacity.
 - (iii) Cycle life. (06 Marks)
 - d. Discuss the construction and working of Zinc-air battery. (04 Marks)
- 2
 - a. List out different types of electrodes with an example. (06 Marks)
 - b. The emf of the cell $\text{Cd}/\text{CdSO}_4(0.0093\text{M})//\text{CdSO}_4/\text{Cd}('X'\text{M})$ is 0.086 V at 25°C. Find the value of 'X'. (04 Marks)
 - c. What are fuel cells? Compare conventional cell and fuel cell. Mention the advantages of fuel cell. (06 Marks)
 - d. Discuss the construction and working of methanol-oxygen fuel cell. (04 Marks)

Module – 2

- 3
 - a. Explain the electrochemical theory of corrosion by taking Iron as an example. (05 Marks)
 - b. Explain the following factors affecting the rate of corrosion:
 - (i) Nature of corrosion product.
 - (ii) Polarization of anodic and cathodic regions. (05 Marks)
 - c. Discuss decomposition potential which governs the electroplating. (04 Marks)
 - d. Explain any three factors which influence the natures of electro deposit. (06 Marks)
- 4
 - a. Explain waterline corrosion and caustic embrittlement in boilers. (06 Marks)
 - b. Discuss Tinning process. (04 Marks)
 - c. Explain the electroplating of hard chromium. (05 Marks)
 - d. Distinguish electroplating and electroless plating. (05 Marks)

Module – 3

- 5
 - a. Explain the determination of calorific value of a non-volatile liquid fuel using Bomb calorimeter. (05 Marks)
 - b. What is reformation of petrol? Write the reactions involved in it. (05 Marks)
 - c. Discuss the construction and working of PV-cell. (04 Marks)
 - d. Explain module, array and panel of a PV-cell. (06 Marks)

- 6 a. Discuss : (i) Antiknocking agents and (ii) Biodiesel. (06 Marks)
- b. Calculate gross and net calorific value of a coal sample from the following data:
 Weight of coal sample = 0.89 g
 Weight of water taken in calorimeter = 2600 g.
 Water equivalent of calorimeter = 350 g,
 Latent heat of steam = 2465 KJ/kgs
 Specific heat of water = 4.187 KJ/kg/°C
 Rise in temperature = 2.8°C
 % of H₂ in coal sample = 4% (04 Marks)
- c. Discuss the production of solar grade silicon by union carbide process. (06 Marks)
- d. Explain doping of silicon by diffusion technique. (04 Marks)

Module – 4

- 7 a. Explain the free radical mechanism of polymerization taking vinyl chloride as a monomer. (06 Marks)
- b. Differentiate between addition and condensation polymerization. (04 Marks)
- c. Give the synthesis reaction of Teflon and polycarbonate. (04 Marks)
- d. Discuss the synthesis, properties and applications of epoxy resin. (06 Marks)
- 8 a. Explain any three structure property relationships of polymers. (06 Marks)
- b. Explain the following factors influencing the T_g:
 (i) Flexibility (ii) Branching and Cross linking. (04 Marks)
- c. Discuss the synthesis of carbon fibre. (04 Marks)
- d. What is conducting polymer? Explain the mechanism of conduction in polyaniline and give the applications. (06 Marks)

Module – 5

- 9 a. What is boiler feed water? Explain the priming and foaming in boilers. (05 Marks)
- b. Discuss the determination of COD of sewage water. (05 Marks)
- c. What is nanomaterial? Discuss the synthesis of nanomaterial by gas condensation. (05 Marks)
- d. Write a note on carbon nanotubes. (05 Marks)
- 10 a. Explain the activated sludge treatment of sewage water. (05 Marks)
- b. Discuss the Desalination of sea water by reverse osmosis. (05 Marks)
- c. Write a note on nano composites. (05 Marks)
- d. Explain the synthesis of nanomaterial by sol-gel method. (05 Marks)

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