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15CHE12/22

**First/Second Semester B.E. Degree(CBCS)Examination,****Engineering Chemistry**

Time: 3 hrs.

Max. Marks: 80

**Note: Answer any FIVE full questions, choosing one full question from each module.****Module-1**

- 1 a. Derive Nernst equation for electrode potential. (05 Marks)  
 b. Discuss the construction and working of calomel electrode. (05 Marks)  
 c. Explain the following characteristics of battery:  
 i) cell potential ii) current and iii) cycle life. (06 Marks)

**OR**

- 2 a. What is electrolyte concentration cell? The cell potential of concentration cell of copper was measured 0.0592V. One of the concentrations of the  $\text{CuSO}_4$  solutions was 0.001M. Calculate the concentration of other  $\text{CuSO}_4$  solution. (05 Marks)  
 b. Discuss the construction and working of Li- $\text{MnO}_2$  battery. (06 Marks)  
 c. Discuss the construction and working of methanol-oxygen fuel cell. (05 Marks)

**Module-2**

- 3 a. Explain the following factors affecting the rate of corrosion:  
 i) ratio of anodic to cathodic area ii) nature of metal and  
 iii) conductivity of medium. (06 Marks)  
 b. Discuss the sacrificial anodic method of control of corrosion. (05 Marks)  
 c. Discuss the electroplating of nickel using Watt's bath. (05 Marks)

**OR**

- 4 a. Explain the pitting and waterline corrosion. (05 Marks)  
 b. Explain the following factors influencing the nature of electro-deposit:  
 i) current density ii) concentration of electrolyte and iii) pH of plating bath. (06 Marks)  
 c. Explain the manufacturing process of double sided PCB with copper. (05 Marks)

**Module-3**

- 5 a. Explain the determination of calorific value of a solid fuel using bomb calorimeter. (06 Marks)  
 b. Discuss the synthesis of petrol by Fischer-Tropsch process. (05 Marks)  
 c. Discuss the construction and working of PV cells. (05 Marks)

**OR**

- 6 a. Explain the modules, panels and arrays of PV cells. (06 Marks)  
 b. Discuss the production of solar grade silicon by union carbide process. (05 Marks)  
 c. 0.85g of coal sample (carbon 90%, H<sub>2</sub> 5% and ash 5%) was subjected to combustion in a bomb calorimeter. Mass of water taken in the calorimeter was 2500cm<sup>3</sup> and the water equivalent of the calorimeter was 650cm<sup>3</sup>. The rise in temperature was found to be 3.2°C. Calculate the gross and net calorific values of the sample. Latent heat of steam = 2.457 KJg<sup>-1</sup> and specific heat of water = 4.187 KJ Kg<sup>-1</sup> K<sup>-1</sup>. (05 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
 2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.

**Module-4**

- 7 a. Explain the types of polymerization with example. (04 Marks)  
b. Explain the following factors influencing the T<sub>g</sub>:  
i) inter molecular forces ii) flexibility and iii) branching & cross linking. (06 Marks)  
c. Write the synthesis reactions of following polymers:  
i) PMMA ii) polyurethane and iii) polycarbonate. (06 Marks)

**OR**

- 8 a. A polymer sample contains 100, 200, 300 and 400 molecules having molecular mass 1000, 2000, 3000 and 4000 respectively. Calculate the number average and weight average molecular masses of the polymer. (05 Marks)  
b. What is conducting polymer? Explain the mechanism of conduction in polyaniline. (06 Marks)  
c. Write the synthesis reactions and properties of silicone rubber. (05 Marks)

**Module-5**

- 9 a. Explain the scale and sludge formation in boiler. (05 Marks)  
b. Explain the determination of dissolved oxygen content in water by Winkler's method. (06 Marks)  
c. Write a note on fullerenes. (05 Marks)

**OR**

- 10 a. Explain desalination of sea water by ion selective electro dialysis process. (05 Marks)  
b. Explain the synthesis of nano material by chemical vapour condensation and precipitate methods. (06 Marks)  
c. Write a note on dendrimers. (05 Marks)

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