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17CHE12/22

First/Second Semester B.E. Degree Examination, June/July 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 is single electrode potential? Obtain an expression for the same. **(07 Marks)**
   b. What are reference electrodes? Explain the construction and working of Calomel electrode. **(07 Marks)**
   c. Write a note on following battery characteristics:
      (i) Capacity   (ii) Current   (iii) Shelf life **(06 Marks)**

OR

2 a. What are batteries? Explain the construction and working of Li-MnO$_2$ battery. Mention its applications. **(07 Marks)**
   b. Explain the construction and application of CH$_3$OH-O$_2$ fuel cell. Mention its applications. **(07 Marks)**
   c. The cell potential of Cu concentration cell Cu | Cu^{2+}(0.0093 M) | | CuSO$_4$(X) | Cu is 0.086 V at 25°C. Write cell reaction and calculate the value of 'X'. **(06 Marks)**

Module-2

3 a. What is corrosion? Explain the resting of Iron by using electrochemical theory. **(07 Marks)**
   b. What is cathodic protection? Explain sacrificial anodic method and impressed current method. **(07 Marks)**
   c. What is metal finishing? Explain the following :
      (i) Polarization   (ii) Over voltage. **(06 Marks)**

OR

4 a. Discuss the effect of following on nature of electrodeposit:
      (i) Current density   (ii) pH   (iii) Temperature. **(07 Marks)**
   b. Explain the electroplating of Nickel. **(07 Marks)**
   c. Write a note on the following :
      (i) Galvanic corrosion   (ii) Concentration cell corrosion (water line and pitting). **(06 Marks)**

Module-3

5 a. What is calorific value? Explain the experimental determination of calorific value of fuel by using Bomb calorimeter. **(07 Marks)**
   b. Calculate the gross and net calorific value of a coal sample from the following data obtained from Bomb-calorimeter experiment:
      (i) Weight of coal = 0.73 g,   (ii) Weight of water taken in calorimeter = 1500 g.
      (iii) Water equivalent of calorimeter = 470 g   (iv) Initial temperature = 25.0°C   (v) Final temperature = 27.3°C   (vi) % of H$_2$ in coal = 2.5%   (vii) Latent heat of steam = 587 cal g^{-1}. **(07 Marks)**
   c. Explain the production of solar grade Si by union carbide process. **(06 Marks)**

OR

6 a. Explain the construction and working of typical P.V. cell. (07 Marks)
  b. What are solar cells? Explain the modules panels and arrays. (07 Marks)
  c. Explain the fluidized bed catalytic cracking process. (06 Marks)

Module-4

7 a. What are polymers? Explain the addition polymerization mechanism by taking Vinyl Chloride as example (07 Marks)
  b. What is glass transition temperature? Explain the factors affecting T_g value. (07 Marks)
  c. Explain the synthesis of
     (i) Plexi glass   (ii) Epoxy resin. (06 Marks)

OR

8 a. What are elastomers? Explain the synthesis and applications of Silicone rubbers. (07 Marks)
  b. What are conductivity polymers? Write the mechanism of polyaniline. (07 Marks)
  c. Calculate the $\bar{\mu}_n$ and $\bar{\mu}_w$ for a polymer sample consisting of 10% by weight of macromolecules of molecular weight 10,000 and 90% by weight of molecules with molecular weight 100000. $M_1 = 10$, $M_2 = 90$. (06 Marks)

Module-5

9 a. What is boiler feed water? Explain the scale and sludge formation in boiler. (07 Marks)
  b. 25 ml of waste water was mixed with 10 ml of $K_2Cr_2O_7$, acidified and refluxed. The unreacted $K_2Cr_2O_7$ acidified required 15.2 ml of 0.3N FAS. In blank titration 10ml of $K_2Cr_2O_7$ acidified required 19.4 ml of same 0.3N FAS. Calculate COD of waste water. (07 Marks)
  c. Write a note on Fullerenes. Mention its applications. (06 Marks)

OR

10 a. What are nano materials? Explain the synthesis of nanomaterials by Sol-gel method. (07 Marks)
   b. Write note on the following :
      (i) Carbon nanotubes   (ii) Dendrimers (06 Marks)
   c. What is desalination? Explain desalination of water by electrodialysis. (07 Marks)

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