Subject Code: R13204/R13

I B. Tech II Semester Regular/Supplementary Examinations May - 2016
ENGINEERING CHEMISTRY
(Common to ECE, EEE, EIE, Bio-Tech., E Com E, Agri E)

Time: 3 hours   **Max. Marks: 70**

Question Paper Consists of **Part-A** and **Part-B**

Answering the question in **Part-A** is Compulsory,

Three Questions should be answered from **Part-B**

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PART-A

1. (a) Water sample on analysis gave the following results: $Mg(HCO_3)_2$ = 70 mg/L, $CaCl_2$ = 220 mg/L, $MgSO_4$ = 120 mg/L, $Ca(NO_3)_2$ = 164 mg/L. Calculate the quantity of lime (80% pure) and soda (90% pure) needed for softening of 20,000 liters of water.
   (b) Explain the determination of % carbon and % oxygen present in coal by ultimate analysis.
   (c) Write notes on (i) electro chemical series (ii) sacrificial anodic protection
           (iii) mechanical properties of polymers (iv) deterioration of cement concrete

                                                       [5+5+12]
PART-B

2. (a) Describe the complexometric method for determination of hardness of water.
   (b) What is boiler corrosion and explain the factors causing boiler corrosion.
   (c) Explain preparation, properties and applications of Bakelite.

                                                       [6+5+5]
3. (a) Define battery. Explain the working of lead-acid storage battery with proper chemical equations.
   (b) Write notes on potentiometric titrations.
   (c) Write notes on octane and cetane number.

                                                       [6+5+5]
4. (a) Write notes on electroplating and metal cladding.
   (b) What is dry corrosion? Explain the role of nature of oxide films formed on further oxidation corrosion process.
   (c) What are green house gases? Explain any one method of green synthesis.

                                                       [6+5+5]
5. (a) What are the drawbacks of natural rubber? Explain how to overcome it.
   (b) Write the differences between thermoplastics and thermosetting plastics.
   (c) What is desalination of water? Explain electrodialysis.

                                                         [6+5+5]
6. (a) What is HCV & LCV? Mention units for heat.
   (b) What is cracking? Why petrol obtained by catalytic cracking is better than straight run petrol.
   (c) Derive Nernst equation of electrochemical cell.

                                                       [6+5+5]
7. (a) Explain the working and importance of PV cell and solar reflectors.
   (b) What are nanomaterials? Explain synthesis of CNTs by CVD method.
   (c) Explain the factors (nature of metal) affecting the rate of corrosion.   **[6+5+5]**

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PART-A

1. (a) A sample of coal was found to contain: C = 80%, H = 5%, O = 1%, N = 2%, remaining ash. Calculate the amount and volume of minimum air required for complete combustion of 4 kg of coal sample.
   (b) Write notes on types of CNTs and their applications.
   (c) Write notes on (i) carbonate and non-carbonate hardness of water (ii) glass electrode (iii) stereoregular polymers (iv) pitting corrosion

[5+5+12]

PART-B

2. (a) Explain softening of hard water by ion-exchange process.
   (b) Explain the formation of scales. How can they be avoided?
   (c) What is gutta percha? Write the preparation and applications of BUNA-S.

[6+5+5]

3. (a) What is Kohlrausch law? Explain its applications.
   (b) Explain the construction and working of calomel electrode.
   (c) Explain how Bomb calorimeter can be used to determine calorific value of a fuel.

[6+5+5]

4. (a) What is corrosion? Explain electrochemical theory of corrosion.
   (b) Explain the protection of metals from corrosion by proper selection and designing.
   (c) Explain synthesis of CNTs by arc discharge method and applications of CNTs.

[6+5+5]

5. (a) Write the preparation and applications of PVC and PE.
   (b) What is compounding of plastics. Which properties can be improved by addition of additives.
   (c) Calculate the amount of lime and soda required for softening 10,000 litres of water sample, which contains Mg^{2+} = 36 ppm, Ca^{2+} = 20 ppm and HCO_3^{2-} = 183 ppm.

[6+5+5]

6. (a) Explain proximate analysis of coal and its significance.
   (b) Write notes on fractional distillation of petroleum with a neat sketch.
   (c) Explain the working of H_2-O_2 fuel cell with neat sketch.

[6+5+5]

7. (a) Write notes on setting and hardening of cement with proper chemical equations.
   (b) Write brief notes on types of liquid crystals.
   (c) Compare galvanizing and tinning as methods of protecting iron from corrosion.

[6+5+5]

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Set No - 3

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PART-A

1. (a) What are the types of hardness of water and mention units of hardness.
   (b) Calculate the gross and net calorific value of coal having the following composition: carbon – 86%, hydrogen – 9%, sulphur – 1%, nitrogen – 1%, ash – 3%. Latent heat of steam – 587 cal/g.
   (c) Write notes on (i) concentration cell (ii) Impressed current cathodic protection (iii) preparation of thiokol (iv) thermotropic liquid crystals

[5+5+12]

PART-B

2. (a) Explain the method of separating water from the saline water.
   (b) What is permutit process? Explain softening of water by permutit process.
   (c) Write notes on physical and mechanical properties of polymers.

[6+5+5]

3. (a) Explain conductometric titration of a (i) strong acid with a strong base (ii) weak acid and strong base
   (b) Explain the working of dry cell.
   (c) How carbon and sulphur present in coal is estimated? Also explain the significance of their presence in coal.

[6+5+5]

4. (a) Explain electrochemical theory of corrosion.
   (b) Write the differences between tinning and galvanizing.
   (c) Write notes on (i) green house concept (ii) deterioration of cement concrete by CO_2.

[6+5+5]

5. (a) Write any two moulding techniques for fabrication of plastics.
   (b) Explain free radical addition polymerization.
   (c) Discuss priming and foaming. How can they be avoided?

[6+5+5]

6. (a) Write notes on refining of petroleum.
   (b) Discuss LPG and CNG.
   (c) Explain single electrode potential of a cell.

[6+5+5]

7. (a) Write notes on (i) supercritical fluid extraction (ii) phase transfer catalyst methods of green synthesis.
   (b) Explain any one method for CNTs synthesis.
   (c) Write notes on constituents of paints and their functions.

[6+5+5]

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PART-A

1. (a) Explain treatment of water for domestic use.
   (b) The percentage composition of a sample of bituminous coal was found to be: C = 75.4%, H = 5.3%, O = 12.6%, N = 3.2%, S = 1.3% and remaining ash. Calculate the minimum weight and volume of air necessary for complete combustion of 2 kg of coal.
   (c) Write notes on (i) fuel cell (ii) metal cladding (iii) applications of BUNA-S (iv) applications of fullerenes

[5+5+12]
PART-B

2. (a) Write notes on caustic embrittlement and reverse osmosis.
   (b) Explain the softening of water by hot lime soda process.
   (c) Explain preparation and applications of phenol formaldehyde resin.

[6+5+5]

3. (a) Explain the applications of electrochemical series.
   (b) Explain the working of Ni-Cd cell with chemical reactions.
   (c) Explain proximate analysis of coal and its significance.

[6+5+5]

4. (a) Discuss dry corrosion theory.
   (b) Write notes on hot dipping and impressed current cathodic protection.
   (c) Discuss p-type conducting polymers.

[6+5+5]

5. (a) What is compounding? Explain compounding of plastics.
   (b) Explain vulcanization of rubbers and its applications.
   (c) What is sterilization of water? Explain break-point chlorination.

[6+5+5]

6. (a) What is cracking? Explain moving bed catalytic cracking with a neat sketch.
   (b) Explain any one method for synthesis of petrol.
   (c) Discuss ion-selective electrode.

[6+5+5]

7. (a) Write notes on thermotropic liquid crystals and their applications.
   (b) Write the applications of green chemistry.
   (c) What is corrosion? Explain differential aeration and pitting corrosion.

[6+5+5]

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