

**Subject Code: R13104/R13**

**Set No - 1**

**I B. Tech I Semester Regular/Supple. Examinations Nov./Dec. - 2015**

**ENGINEERING CHEMISTRY**

(Common to CE,ME,CSE,PCE,IT,Chem E,Aero E,AME,Min E,PE,Metal E,Textile Engg.)

**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) Differentiate between scale and sludge.
- (b) What is galvanic series? In which way is it different from electrochemical series.
- (c) Explain differential aeration corrosion.
- (d) Write notes on p-type conducting polymers.
- (e) Find HCV and LCV of a coal sample containing: 75% C; 10% H<sub>2</sub>; 8% O<sub>2</sub>; 5% N<sub>2</sub> and 2% S and remaining is ash. Assume latent heat of steam.

[3+5+4+5+5]

**PART-B**

2. (a) Discuss caustic embrittlement and boiler corrosion and how they can be avoided.
- (b) Explain the charging and discharging of lead acid-battery.
- (c) Discuss organic surface coatings. [6+6+4]
3. (a) Discuss the preparation and properties of Bakelite.
- (b) Explain proximate analysis of coal and their significance.
- (c) Describe with a neat sketch cold lime soda process. [6+6+4]
4. (a) Explain Kohlrausch law and its applications.
- (b) Discuss sterilization and disinfection of water.
- (c) Write notes on biodegradable polymers. [6+6+4]
5. (a) Explain dry theory of corrosion.
- (b) Explain the compression and injection moulding techniques of plastics.
- (c) Discuss standard hydrogen electrode. [6+6+4]
6. (a) Discuss green house effect.
- (b) Write notes on electroplating and hot dipping.
- (c) Write notes on cetane number and natural gas. [6+6+4]
7. (a) With a neat sketch, explain fixed bed catalytic cracking.
- (b) Explain any two methods of synthesis of carbon nanotubes.
- (c) Differentiate between thermosetting and thermoplastics. [6+6+4]

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**Time: 3 hours**

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**PART-A**

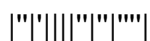
1. (a) Write notes on turbine deposits.
- (b) Why are galvanized utensils not used for storing food stuffs?
- (c) The percentage composition of a sample of anthracite coal is C = 90; H = 3.5; O = 3; N = 2; S = 0.5 and remainder is ash. Estimate the minimum weight of air required for combustion of 1 Kg of this fuel and the composition of the dry products of combustion by volume if 50% excess air is supplied. Assume latent heat of condensation of steam.
- (d) Discuss the preparation, properties and uses of polyethylene.
- (e) Write any three engineering applications of liquid crystals and nanomaterials.

[3+2+5+6+6]

**PART-B**

2. (a) Explain with a neat sketch zeolite process for softening of hard water.
  - (b) Derive Nernst equation of a electrochemical cell.
  - (c) Discuss the constituents of paints and its functions.
- [6+6+4]
3. (a) Discuss the preparation, properties and uses of thiokol.
  - (b) With a neat sketch, explain fluid bed catalytic cracking.
  - (c) Define temporary and permanent hardness of water. Mention the units of hardness of water.
- [6+6+4]
4. (a) Explain the construction of glass electrode and calomel cell.
  - (b) Discuss electro dialysis method for desalination of water.
  - (c) Write notes on fullerenes.
- [6+6+4]
5. (a) Discuss electrochemical theory of corrosion.
  - (b) With the help of free radical , explain addition polymerization.
  - (c) Write notes on potentiometric titrations.
- [6+6+4]
6. (a) Explain the chemical reactions that take place during setting and hardening of cement.
  - (b) Explain any two metallic coating methods to protect base metal.
  - (c) Discuss fractional distillation of petroleum.
- [6+6+4]
7. (a) Discuss the merits and demerits of liquid fuels.
  - (b) Discuss any two methods for green synthesis.
  - (c) Discuss stereospecific polymers and its significance.
- [6+6+4]

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**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) Plasticized PVC is soft and flexible, while Bakelite is hard and rigid. Explain.
  - (b) Discuss the characteristics of potable water.
  - (c) A gas has the following composition by volume: CO= 40%; H<sub>2</sub> = 17%; CO<sub>2</sub> =5%, CH<sub>4</sub> =3% and N<sub>2</sub> = 35%. What will be the composition of dry flue gas, if 50% excess air was used for burning 100m<sup>3</sup> of the gas.
  - (d) Write notes on (i) fluoride electrode (ii) solar reflectors (iii) Pilling Bedworth rule
- [3+5+5+9]

**PART-B**

2. (a) Explain reverse osmosis and its advantages.
  - (b) Discuss conductometric titrations of (i) strong acid versus strong base (ii) weak acid and weak base.
  - (c) Explain how corrosion is minimized by proper design of material.
- [6+6+4]
3. (a) Discuss compounding of plastics.
  - (b) Explain how carbon, hydrogen and ash are determined by ultimate analysis.
  - (c) Discuss the effect of CO<sub>2</sub> and dissolved O<sub>2</sub> on boiler corrosion and how they can be removed.
- [6+6+4]
4. (a) Write notes on single electrode potential and galvanic cell.
  - (b) Discuss the reactions occurring in lime-soda process.
  - (c) Write notes on the decay of cement concrete.
- [6+6+4]
5. (a) Write notes on (i) Impressed current cathodic protection (ii) galvanizing and tinning
  - (b) Discuss the preparation, properties and uses of BUNA S.
  - (c) Explain how to differentiate between strong and weak electrolytes from molar conductance at different dilutions.
- [6+6+4]
6. (a) Discuss on conducting polymers.
  - (b) Discuss the influence of temperature, pH and humidity on corrosion.
  - (c) Differentiate between gross calorific value and net calorific value.
- [6+6+4]
7. (a) Write notes on diesel knocking and CNG.
  - (b) Explain the need of green chemistry.
  - (c) With a neat sketch explain extrusion moulding technique of plastics.
- [6+6+4]

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**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) Why hardness is expressed in terms of  $\text{CaCO}_3$  equivalents.
- (b) Differentiate between anodic and cathodic coatings.
- (c) Discuss the mechanical properties of polymers.
- (d) Explain how sulphur and nitrogen are determined by ultimate analysis.
- (e) Calculate the potential of Ag-Zn cell at 298 K if the concentration of  $\text{Ag}^{+2}$  and  $\text{Zn}^{+2}$  are  $4.5 \times 10^{-4} \text{ M}$  and  $1.5 \times 10^{-2} \text{ M}$  respectively.  $E^0$  of the cell at 298 K is 1.5V.

[3+4+5+5+5]

**PART-B**

2. (a) Explain ion-exchange process for softening of hard water.
  - (b) Explain concentration cells with a suitable example.
  - (c) Discuss electroless plating and cladding.
- [6+6+4]
3. (a) What are the limitations of natural rubber and explain how to improve the properties of rubber?
  - (b) Write notes on CNG and LPG.
  - (c) Discuss priming and foaming and how can they be avoided.
- [6+6+4]
4. (a) Write the anodic, cathodic and net reactions of Ni-Cd battery and dry cell.
  - (b) Discuss the principle of complexometric estimation of hardness of a water sample.
  - (c) Write the working of the photovoltaic cells.
- [6+6+4]
5. (a) Write notes on cathodic protection.
  - (b) Discuss the preparation, properties and uses of PVC.
  - (c) Write notes on fuel cells.
- [6+6+4]
6. (a) Discuss fiber reinforced plastics.
  - (b) Explain the factors that affect the rate of corrosion.
  - (c) Calculate the weight and volume of air required for the combustion of 2 kg of carbon.
- [6+6+4]
7. (a) Discuss refining of petroleum.
  - (b) Discuss the types of liquid crystals.
  - (c) Differentiate between addition and condensation polymerization.
- [6+6+4]

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