Code : 231101

B.Tech 1st Semester Examination, 2016

Engg. Chemistry

Time : 3 hours *Full Marks : 70*

Instructions :

(i) There are Nine Questions in this Paper.

(ii) Attempt any five questions.

(iii) ***Question No. 1 is Compulsory.***

(iv) The marks are indicated in the right-hand margin.

1. Fill in the blanks/Answer any seven of the following : 2×7=14

(a) Permanent hardness of water is caused by soluble salts of ..... and ..... $MgCl_2$

(b) In proximate analysis of coal carbon percentage is determined by the formula : .....

(c) Coal can be converted to coke by the process of .....

(d) Colligative properties are not associated with ..... of solute.

(e) Inter-crystalline cracking occurs in boiler due to presence of.....

(f) Oxidation occurs at ..... and ..... at cathode in an electrochemical cell.

P.T.O.

(g) A polymer made of more than one type of monomer is .....

(h) Write the formula of weight average moleculer weight a polymer.

(i) The metal which forms a volatile oxide film corrode .....

(j) Reverse-osmosis is a process to remove ..... from sea water.

2. (a) Why water is softened before using in a boiler? Describe the phosphate conditioning of water to over come the boiler feed problem. 2+6

(b) Calculate the amount of lime and soda required for softening of 1,000 litres of water with the following analysis. 6

Analysis of Raw water	Analysis of treated water
Ca^{2+}=380 ppm, dissolved CO_2=120 ppm	OH^- = 36 ppm
Mg^{2+} = 144 ppm Fe $SO_4.7H_2O$=278 ppm	CO_3^{2-} = 32 ppm
H CO_3^- =1500 ppm	

3. (a) How boiler scales are formed ? How scales are removed from the boiler ? Differentiate between a scale and sludge. 6

(b) In the determination of hardness of water by EDTA method. $NH_4OH - NH_4Cl$ buffer is used why? 4

(c) Discuss the principle of Ion exchange method what advantages it has over zeolite softners? 4

4. (a) What do you understand by high temperature carbonization of coal? 2

(b) How coke is obtained by using Beehive oven and what are the limitations of this process. 6

(c) A gas has the following composition by volume: 6

H_2=22% CH_4=4% CO=20% CO_2=6% O_2=3% and N_2=45%. If 25% excess air is used for combustion, find the weight of air supplied per m^3 of this gas (weight of 1 kg role of air at NTP=28.95 kg)

5. (a) What are reference electrodes ? What is the role of reference electrode in the determination of electrode potential ? 4

(b) What do you understand by a concentration cell? Give at least two applications of concentration cell. 4

(c) For what concentration of Ag+(ag) will the EMF of the cell be zero at 25°C if the conc. of Cu^{2+}(ag) is 0.01M

cu(s) /Cu^{2+}(0.01M)// $Ag^{+(ag)}$/Ag(s)

Given $E^{o}(Ag^{+}/Ag) = +0.80\ V$; $E^{o}_{(Cu^{2+}/Cu)} = 0.338V$ 6

6. Explain the following: 3½×4=14

(a) Pitting corrosion

(b) Intergranular corrosion

(c) Passivation

(d) Waterline corrosion

7. (a) Why rubbers called elastomers ? What is natural rubber? 4

(b) What is vulcanization of rubber ? Explain the advantages of vulcanized rubber over natural rubber. 4

(c) Give the structure and properties and uses of the following polymers. 3+3

(i) Nylon (ii) Glyptal

8. (a) Why is relative lowering vapour pressure a colligative property? 4

(b) What do you mean by colligative property? 2

(c) The pressure of water vapour of a solution containing a non-volatile solute is 2% below that vapour of pure water. Calculate the modality of the solution. 8

9. Write short note on any four of the following:

(a) Pilling-Bed worth rule

(b) Working of Bomb calorimeter(draw diagram also)

(c) Direct coal to liquid conversion process

(d) Thermoplastics

(e) Priming and foaming.