

Engineering Chemistry

P. Pages : 2

Time : Two Hours

**NIR/KW/18/3283/3938**

Max. Marks : 40

- Notes :
1. All questions carry marks as indicated.
 2. Solve Question 1 OR Questions No. 2.
 3. Solve Question 3 OR Questions No. 4.
 4. Solve Question 5 OR Questions No. 6.
 5. Solve Question 7 OR Questions No. 8.
 6. Diagrams and chemical equations should be given whenever necessary.
 7. Illustrate your answers whenever necessary with the help of neat sketches.
 8. Use of non programmable calculator is permitted.

1. a) A water sample on analysis gave the following data in PPM : **8**
 $\text{Ca}(\text{HCO}_3)_2 = 81$, $\text{Mg}(\text{HCO}_3)_2 = 73$, $\text{MgSO}_4 = 240$, $\text{CO}_2 = 88$, $\text{NaCl} = 58.5$
 Calculate the total cost of lime (93% pure) & soda (97% pure) required to soften 2 million liters of water if cost of lime & soda Rs. 350 and Rs. 4200 per 100 kg respectively.

- b) How corrosion in the boiler caused due to dissolved oxygen & how it can be removed ? **4**

OR

2. a) A Zeolite softener was completely exhausted when 10,000 liter of water was passed through it. The exhausted zeolite bed required 300 liters of 2.6% NaCl solution for complete regeneration. Calculate hardness of water sample. **4**

- b) Explain desalination of breaking water by reverse osmosis. State its limitations & advantages. **4**

- c) What is caustic embrittlement ? Discuss preventative measures to reduce it. **4**

3. a) Discuss the importance of proper designing and material selection to reduce the extent of corrosion. **4**

- b) Justify with proper reason. **6**

- i) A water tank filled with water will undergoes corrosion at waterline of it.
- ii) Wire mesh corrodes at crossings.
- iii) Corrosion of metal is considered as reverse of extraction of metals.

OR

4. a) Write a note **any two**. **6**

- i) Water line corrosion.
- ii) Cathodic protection by impressed current.
- iii) Electro plating.

- b) State and explain pilling Bedworth rule with suitable examples. 4
5. a) Describe with well labelled diagram of rotary Kiln, how cement is manufactured by wet process ? 6
- b) Explain any one : 2
- i) Heat of hydration
- ii) Soundness of cement.

OR

6. a) Explain the setting & hardening of port level cement. 4
- b) What is the significance of the following additives in cement. 4
- i) Accelerators
- ii) Water repelling agents.
7. a) Define green chemistry ? State its principles and explain any two of them in detail. 4
- b) Write short note on : 6
- i) Supercritical carbon dioxide.
- ii) Carbon credits
- iii) Biocatalysis.

OR

8. a) What are fuel cells ? Explain working of H_2O_2 alkaline fuel cell with its advantages and limitation. 4
- b) Explain following : 4
- i) Power density & energy
- ii) Primary battery
- c) Discuss application of lithium ion battery. 2
