B.E. All Branches First Semester (C.B.S.) / B.E. (Fire Engineering) First Semester

Engineering Chemistry

P. Pages : 2 **NRT/KS/19/3283/3938**

Time : Two Hours * 0 1 1 8 * 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: **8**

$MgCl_2 - 95ppm$

$CaSO_4 - 272ppm$

$MgSO_4 - 120ppm$

$H_2SO_4 - 49ppm$

$SiO_2 - 4ppm$

Calculate the amount of lime (95% pure) and soda (97% pure) required for treatment of 1 million litres of water. If the cost of lime & soda are Rs. 400 & Rs. 3000per 100 kg each respectively, calculate the total cost of chemicals used for treatment of 1 million litres of water.

b) What is the purpose of internal treatment for boiler water? Explain phosphate conditioning. **4**

OR

2. a) A zeolite Softner was exhausted by removing the hardness completely when 5000 litres of water is passed through it. The exhausted Zeolite bed then required 150 litres of 8% NaCl solution for complete regeneration. Calculate the hardness of water sample. **4**

b) What is Stenlization of water? Explain the break point chlorination. **3**

c) Explain with chemical equations the demineralization of hard water & regeneration of ion exchange Resins. **5**

3. a) Explain the mechanism of electrochemical corrosion by H_2 – evolution and absorption of O_2 with neat diagrams. **5**

b) Write short notes on **any two:** **5**

i) Factors affecting rate of corrosion.
ii) Cathodic protection by Sacrificial anode.
iii) Corrosion of water filled tank occurs below waterline.

OR

4. a) How corrosion can be prevented with proper design & material selection? **4**

b) Write short notes on **any three:** **6**
i) Pilling Bedworth Rule ii) Stress Corrosion
iii) Protective Coating iv) Pitting Corrosion

5. a) Discuss with a well labelled diagram of rotary Kiln how cement is manufactured by wet process. Also give the various reactions involved during manufacturing process. **6**

b) What are cement additives? Explain any two. **2**

c) Write properties and application of Fly Ash. **2**

OR

6. a) Explain the setting and Hardening of Cement. **4**

b) Write short notes on **any two.** **4**
i) Low heat cement
ii) Rapid Hardening Cement
iii) White Cement

c) What is soundness of cement? How it is related with excess CaO in raw materials of cement. **2**

7. a) Define green chemistry. State its principles and explain any two principles with example. **4**

b) Write short notes on **any two.** **4**
i) Carbon Credits
ii) Biocatalysis
iii) Lithium battery

OR

8. a) Explain the behaviour of supercritical carbon dioxide with the help of phase diagram. **4**

b) Write short notes on **any two** : **4**
i) Ni-Cd batteries.
ii) Fuel cell.
iii) Energy density and power density of battery

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