B.E. I & II Sem-I & II (Old) (Common for All Branches)

103 - Applied Chemistry

P. Pages : 2 **GUG/S/19/1455**

Time : Three Hours Max. Marks : 80

Notes : 1. All questions carry equal marks.
2. Assume suitable data wherever necessary.
3. Diagrams and chemical equation should be given wherever necessary.
4. Use of calculator is allowed.

1. a) Explain with chemical equations the demineralisation of Hard water regeneration of resins. **6**

b) The hardness of 30,000 litres of water sample was completely removed by passing it through a zeolite softner. The zeolite Softner required 320 litres of NaCl solution for regeneration. If the water has a hardness equivalent to 191 ppm of $CaCO_3$. Calculate the concentration of the NaCl solution used. **5**

c) How scales are formed? Discuss Removal of scales and disadvantages of scales. **5**

OR

2. a) A water sample on analysis gave the following results in ppm, **11**
$Ca(HCO_3)_2 = 121.5$, $Mg(HCO_3)_2 = 109.5$, $CaCl_2 = 222$, $Mg(NO_3)_2 = 148$,
$MgCl_2 = 95$, Turbidity = 8.
80,000 litres of water was softened using coagulant $NaAlO_2$ @ 8.2 ppm. After the treatment the treated water was found to contain $OH^- = 34\,ppm$ and $CO_3^{2-} = 30\,ppm$.
Calculate the quantities of lime (81% pure) and soda (92% pure) required for softening.

b) Calculate carbonate Non carbonate and Total Hardness of above water sample. **3**

c) Explain advantages of Break - point chlorination. **2**

3. a) Write a note on
i) Pitting corrosion **4**
ii) Alkaline fuel cell **4**
iii) Electroplating **4**

b) Explain differential Aeration theory of corrosion. **4**

OR

4. a) Write a informative note on Nickel - cadmium Battery. **4**

b) Discuss the importance of design and material selection in controlling corrosion. **6**

c) Give Reasons **6**
i) Corrosion of water filled steel tanks occurs below the waterline.
ii) Rusting of Iron is quicker in saline water than in ordinary water.

5. a) Explain Dry manufacturing process of Portland cement. **8**

b) Discuss High Alumina cement with respect to its properties, composition and applications. **4**

c) Write a note on concept of carbon credits. **4**

OR

6. a) Explain basic principles of green chemistry with suitable examples. **8**

b) Discuss setting and Hardening of cement. **4**

c) Explain **4**
i) White cement ii) Fly Ash as cementing material.

7. a) Explain principle and working of 'Bomb calorimeter' with a well labelled diagram. **6**

b) Write a note on. **6**
i) Doping agent in petrol ii) Bio - diesel

c) The following data is obtained in a Boy's calorimeter experiment. **4**
Volume of gaseous fuel burnt at NTP = 0.093 m^3.
Weight of the water used for cooling the combustion products = 30.5 kg.
Weight of steam condensed = 0.031 kg
Temperature of Inlet water = 26.1 ºC
Temperature of outlet water = 36.5 ºC
Determine the Gross and Net calorific values of the gaseous fuel per m^3 at NTP.

OR

8. a) What is the significance of ultimate analysis of coal. **3**

b) How synthetic petrol is obtained by Fischer - Tropsch process. **6**

c) What is octane number and cetane number. **3**

d) Ultimate analysis gave following results by Dulong's formula. C = 73.2%, H =7.09%, O=11.33%, S=1.2%, N=2.8% and remaining Ash. Calculate Gross and Net calorific value. **4**

9. a) Explain Boundary Lubrication. **4**

b) Write short notes on.
i) Semi - Solid Lubricants. **4**
ii) Structure and properties of Graphite as Lubricant. **4**

c) A Lubricating oil has same saybolt universal viscosity as that of standard Gulf and Pennsylvanian type oils at 210 ºF. Their Viscosities at 100 ºF are 525 SUS, 762 SUS and 289 SUS respectively. Find viscosity index of the oil. **4**

OR

10. a) State the criteria for selection of lubricant for Gears. **3**

b) 500 m^3 of gas having following composition,
CH_4 = 56%, O_2 = 11%, H_2 = 18%,
CO = 4.6%, N_2 = 2.8% and C_2H_6 = 7.6% is burnt in a furnace, calculate
i) Theoretical volume and weight of air required for combustion of gas. **6**
ii) Air: Fuel ratio used. **2**
iii) Percentage volumetric composition of dry flue gas, if 28% excess air is used. **5**

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