B. Tech (Common for all Branches) (NEP Pattern) Semester - I

STBSC102 - Engineering Chemistry

P. Pages : 3 **GUG/W/24/16147**

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. All questions are compulsory.

1. a) $Mg(HCO_3)_2 = 73\,ppm,\ CaSO_4 = 68\,ppm, MgSO_4 = 48\,ppm,$
$Ca(HCO_3)_2 = 61\,ppm,\ MgCl_2 = 35\,ppm,\ NaCl = 3.5\,ppm$

Calculate:

i) Temporary and permanent hardness. **2**

ii) Theoretical quantities of lime (88% pure) and soda (92% pure) required to soften 5 million litres of water using sodium aluminate as a coagulant at the rate of 7.6 ppm cost per 100 kg of lime and soda are Rs. 14 and Rs. 46/- resp. **10**

b) A zeolite bed gets exhausted on softening of 5,000 lit of water of hardness 250 ppm $CaCO_3$ equivalent calculate the amount of lit of 10% NaCl sol^n required for its regeneration. **4**

OR

2. a) Describe Zeolite method of water softening and its advantages and limitations. **6**

b) Explain electro-dialysis method of desalination. **5**

c) Explain Caustic embrittlement. **5**

3. a) Write in detail the mechanism of Electrochemical corrosion. **6**

b) Explain corrosion prevention method. **4**

c) Explain: **6**

i) Intergranular corrosion

ii) Cathodic protection

OR

4. a) Describe Alkaline-fuel cell. **4**

b) Discuss the advantages and limitations of Phosphoric Acid Fuel Cell. **4**

c) Write short note on: **8**

i) Pilling-Bedworth Rule.

ii) Anodic Protection

5. a) A boiler is fired with Coal $C = 74\%$. **12**

$H_2 = 6.8\%$, $O_2 = 13.2\%$, $N_2 = 2.1\%$, $S = 1$ and ash 2.9%.

i) Calculate minimum theoretical air required for combustion of 1 kg of fuel.

ii) % composition of dry flue gas by volume if 30% excess air used.

b) Discuss the significance of ultimate analysis of solid fuel. **4**

OR

6. a) Describe the construction and working of Bomb calorimeter. **6**

b) Define: **2**

i) HCV

ii) NCV

c) Write short notes on: **8**

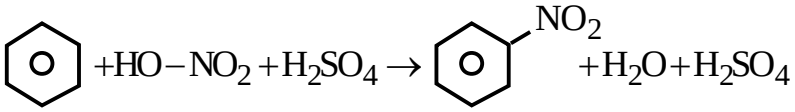
i) Knocking in IC engine

ii) LPG and CNG

7. a) What are the efficiency parameters of green chemistry. **6**

b) Write down the green pathways of synthesis of adipic acid. **5**

c) Calculate atom economy and environmental load factor (E) for the following reaction. **5**



OR

8.	a)	Write down the traditional and green pathways of synthesis of indigo dye.	**8**
	b)	Discuss the goals of green chemistry.	**6**
	c)	Explain concept of carbon credit.	**2**
9.	a)	Explain step growth polymerization in detail.	**4**
	b)	Explain SBR and FRP with respect to their properties and application.	**6**
	c)	Discuss preparation, properties and uses of the following:	**6**
		i) HDPE	
		ii) LDPE	

OR

10.	a)	Discuss free radical mechanism of polymerization.	**4**
	b)	Write down the functionality of monomer.	**4**
	c)	Distinguish between thermoplastic and thermosetting polymers.	**4**
	d)	Explain phenol formaldehyde (Bakelite).	**4**

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