

**B.TECH.**  
**THEORY EXAMINATION (SEM-II) 2016-17**  
**ENGINEERING CHEMISTRY**

Time : 3 Hours

Max. Marks : 100

Note : Be precise in your answer. In case of numerical problem assume data wherever not provided.

**SECTION – A**

1. **Explain the following:** **10 x 2 = 20**
- (a) What do you understand by temporary and permanent hardness of water.
  - (b) Why  $\beta$  carotene absorbs light in visible region?
  - (c) Explain why the value of NCV is greater than GCV.
  - (d) Explain the bonding and antibonding molecular orbitals .
  - (e) Define polymer and polymerization.
  - (f) What is unit cell? What are its types?
  - (g) What is meant by elastomers?
  - (h) Calculate the bond order of  $O_2$ ?
  - (i) Predict the number of signals in  $CH_3CH_2OH$ .
  - (j) Explain Priming and Foaming.

**SECTION – B**

2. **Attempt any five of the following questions:** **5 x 10 = 50**
- (a)
    - (i) What is metallic bond? Explain it on the basis of Molecular Orbital theory.
    - (ii) With the help of MO diagram, calculate the bond order, nature of the following:  
 $N_2$  &  $O_2$
  - (b)
    - (i) Differentiate between addition and condensation polymerization with suitable examples?
    - (ii) Write the method of preparation for the following polymers:  
(i) PMMA      (ii) Orlon      (iii) Polystyrene
  - (c)
    - (i) Discuss the Zeolite method for water softening.
    - (ii) The hardness of 1000 liters of a water sample was completely removed by passing it through a zeolite softener. The softener then required 30 liters of NaCl solution containing 1.5 g/l of NaCl for regeneration. Calculate the hardness of the sample of water.
  - (d)
    - (i) Write possible optical isomers in tartaric acid.
    - (ii) What is the difference between enantiomers and diastereoisomers?
  - (e)
    - (i) Define the terms chromophore and auxochrome in UV spectroscopy.
    - (ii) A compound having concentration  $10^{-3}$  g/l resulted absorbance value 0.20 at  $\lambda_{max}$  510 nm using 1.0 cell. Calculate its absorptivity and molar absorptivity values. Molecular weight of compound is 400.
  - (f) What is electrochemical corrosion? Write down the mechanism involved in electrochemical corrosion. Calculate the amount of rust ( $Fe_2O_3 \cdot 3H_2O$ ) formed by complete rusting of 1 kg of iron.
  - (g) Describe the structure of graphite. How it acts as conductor of electricity. Show, how does the  $S_N^2$  reaction give rise to inverted product while  $S_N^1$  reaction gives a racemic mixture.
  - (h) Show, how does the  $S_N^2$  reaction give rise to inverted product while  $S_N^1$  reaction gives a racemic mixture.

### SECTION – C

Attempt any two of the following questions:

2 x 15 = 30

- 3 (i) What is biogas? How biogas is produced? With the help of diagram, explain Biogas Plant.
- (ii) What is potable water? What are its chemical requirements?
- 4 (i) What are bio degradable polymers? Discuss their applications?
- (ii) How do you prepare the following polymers? (a) Bakelite (b) Perspex (c) Cis-1,4-polyisoprene cross linked through non metal
- 5 (i) For a  $XY_2$  bent molecule show various types of stretching and bending vibrations in IR
- (ii) Calculate temporary and total hardness of a water sample containing: Ca  $(HCO_3)_2$  = 17.4 mg /lit, Mg  $(HCO_3)_2$  = 9.3mg/lit,  $CaSO_4$  = 12.6 mg/lit and  $MgCl_2$  = 8.7 mg /lit.