

**B.TECH**  
**(SEM II) THEORY EXAMINATION 2017-18**  
**ENGINEERING CHEMISTRY**

Time: 3 Hours

Total Marks: 100

**Note:** Attempt all Sections. If require any missing data; then choose suitably.

**SECTION A**

**1. Attempt all questions in brief. 2 x 10 = 20**

- a. Density of ice is less than density of water. Why?
- b. The number of atoms in simple cubic unit cell are  
(i) 4 (ii) 2 (iii) 1 (iv) 6
- c. Differentiate between order and molecularity of a reaction.
- d. For the reaction  $\text{CaCO}_3 (\text{s}) \leftrightarrow \text{CaO} (\text{s}) + \text{CO}_2 (\text{g})$ , calculate the number of components.
- e. What do you understand by the term line of symmetry?
- f. What is sacrificial hyperconjugation? Explain with an example.
- g. Classify polymers on the basis of tacticity.
- h. Bio-degradable polymers do not need to be land filled. Why?
- i. Predict the number of signals in NMR spectrum of  
(i)  $\text{CH}_3\text{CBr}_2\text{CH}_3$  (ii)  $\text{CH}_3\text{CH}_2\text{OH}$
- j. Define GCV and NCV of a fuel.

**SECTION B**

**2. Attempt any three of the following: 10 x 3 = 30**

- a. What are liquid crystals? Give its classification and applications in detail.
- b. Explain phase, components and degree of freedom. Give the phase rule for water system.
- c. (i) Differentiate between  $\text{SN}^1$  and  $\text{SN}^2$  reaction mechanism  
(ii) Give the conformations of n-butane with energy profile diagram.
- d. (i) Differentiate between thermoplastic and thermosetting polymers.  
(ii) Explain the Zeigler Natta Catalysis for stereospecific polymerization.
- e. Give the construction and working of bomb calorimeter. 0.72 gm of a fuel containing 80% carbon, when burnt in a bomb calorimeter, increased the temperature of water from  $27.3^\circ\text{C}$  to  $29.1^\circ\text{C}$ . If the calorimeter contains 250 grams of water and if its water equivalent is 150 grams, Calculate the HCV of fuel.

**SECTION C**

**3. Attempt any one part of the following: 10 x 1 = 10**

- (a) Give the molecular orbital diagram of  $\text{O}_2$  and HF. Also calculate their bond order and magnetic behavior.
- (b) Derive Bragg's Law. Copper has an FCC structure and an atom radius of  $1.278\text{Å}$ . Calculate its density. Given atomic weight of copper as  $63.5 \text{ g/mol}$  and Avogadro's Number as  $0.602 \times 10^{24} \text{ atoms/mol}$ .

4. **Attempt any *one* part of the following:** **10 x 1 = 10**
- (a) Explain the electrochemical theory of corrosion.
  - (b) Differentiate between electrochemical and concentration cells.
5. **Attempt any *one* part of the following:** **10 x 1 = 10**
- (a) Explain in detail the mechanism of Aldol condensation and Hoffmann rearrangement.
  - (b) Differentiate between enantiomers and diastereomers.
6. **Attempt any *one* part of the following:** **10 x 1 = 10**
- (a) What are conducting polymers? Give its classification and applications.
  - (b) Give the method of preparation for the following polymers from their monomers:
    - (i) Melamine (ii) Plexiglass (iii) Kevlar (iv) Nylon 6 (v) Orlon
7. **Attempt any *one* part of the following:** **10 x 1 = 10**
- (a) What do you understand by fingerprint region in IR spectroscopy? What are the different modes of vibration in IR spectroscopy?
  - (b) Explain the proximate and ultimate analysis of coal.