

**B TECH (REGULAR+CARRYOVER)  
(SEM I) THEORY EXAMINATION 2017-18  
ENGG. CHEMISTRY**

Time: 3 Hours

Total Marks: 70

Note: 1. Attempt all Sections. If any missing data is required, then choose suitably.

**SECTION- A**

1. Attempt all questions in brief. 2 x 7 = 14
- Explain when will the value of  $GCV = NCV$ ?
  - The standard reduction potential of three metallic cations X, Y, Z are 0.52, -3.03 and -1.18 V respectively, arrange them in decreasing order of their reducing power.
  - Write any two application of nanotechnology.
  - Arrange the following in the increasing order of their bond energy  $O_2$ ,  $O_2^{2+}$ ,  $O_2^{2-}$ .
  - 100 ml of water sample has hardness equivalent to 12.5 ml of 0.08 N  $MgSO_4$  solutions. Calculate the hardness of this water sample.
  - Will you prefer to polymerize acrylonitrile under anionic or cationic conditions? Explain.
  - How many NMR signals will be obtained for Mesitylene?

**SECTION- B**

2. Attempt any three of the following: 7 x 3 = 21
- Draw the Molecular orbital diagram of  $N_2$  molecule. Calculate its bond order and predict its magnetic behavior.
  - Differentiate between (i) Thermoplastic and Thermosetting (ii) Addition and condensation polymerization.
  - Describe the construction and working of Galvanic cell. Calculate the EMF of the following cell and also write the cell reactions.  
 $Zn | Zn^{2+} (0.001M) || Ag^+ (0.1M) | Ag$   
 The standard potential of  $Ag/Ag^+$  half-cell is +0.80 V and  $Zn/Zn^{2+}$  is -0.76V.
  - Explain the basic principle of lime-soda process. Calculate the amount of lime and soda required for softening 30000 liters of water, using 20 ppm of sodium aluminate as coagulant. Impurities in water are as follows:  $Ca^{2+} = 160$  ppm,  $Mg^{2+} = 96$  ppm, dissolved  $CO_2 = 34$  ppm and  $HCO_3^- = 403$  ppm.
  - What is the basic principle of Bomb calorimeter? A 0.80 g sample of solid fuel was completely combusted in the excess of oxygen using bomb calorimeter. The rise in temperature of water in calorimeter was  $2.5^\circ C$ . Calculate the High calorific value of the

fuel. If water taken in calorimeter is 2000 g and water equivalent of calorimeter is 2200 g. Also calculate low Calorific value. (Given : % Hydrogen in fuel =2.2)

### SECTION- C

3. **Attempt any *one* part of the following:** **7 x 1 = 7**
- a. Explain the structure, properties and applications of graphite.
- b. What are liquid crystals? Differentiate between Nematic and smectic liquid crystal? Write two applications of liquid crystals.
4. **Attempt any *one* part of the following:** **7 x 1 = 7**
- a. What are organometallic compounds? Write their classification, preparation and applications.
- b. Write the preparation, properties and applications of: (i) Nylon -6 (ii) Bakelite.
5. **Attempt any *one* part of the following:** **7 x 1 = 7**
- a. What is Portland cement? Write the reactions involved in setting and hardening of cement.
- b. What are lubricants? Explain the theories of lubrication.
6. **Attempt any *one* part of the following:** **7 x 1 = 7**
- a) Define Phase rule. Apply phase rule to water system
- b) Describe Zeolite process of water softening. A zeolite softener was 90% exhausted by removing the hardness completely when 10,000 litres of hard water was passed through it. The exhausted zeolite bed required 200 litres of 3% sodium chloride solution for its complete regeneration. Calculate the hardness of water sample.
7. **Attempt any *one* part of the following:** **7 x 1 = 7**
- a. What is rank of coal? Describe proximate and ultimate analysis of coal.
- b. i. Explain shielding and deshielding in NMR spectroscopy.  
ii. An aromatic compound (Molecular mass=135) give the following signals in NMR Spectrum.  
(i) Singlet (2.09  $\delta$ ),3H      (ii)A distorted singlet (3.09  $\delta$ ),1H  
(iii)A multiplet(7.27  $\delta$ ),3H      (iv)A multiplet (7.75  $\delta$ ),2H.  
Predict the structure of the compound.