

**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

- a. Explain when will the value of $GCV = NCV$?
- b. 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.
- c. Write any two application of nanotechnology.
- d. Arrange the following in the increasing order of their bond energy O_2 , O_2^{2+} , O_2^{2-} .
- e. 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.
- f. Will you prefer to polymerize acrylonitrile under anionic or cationic conditions? Explain.
- g. How many NMR signals will be obtained for Mesitylene?

SECTION- B

2. Attempt any three of the following:

7 x 3 = 21

- a. Draw the Molecular orbital diagram of N_2 molecule. Calculate its bond order and predict its magnetic behavior.
- b. Differentiate between (i) Thermoplastic and Thermosetting (ii) Addition and condensation polymerization.
- c. 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.
- d. 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.
- e. 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 δ),3H (ii)A distorted singlet (3.09 δ),1H
(iii)A multiplet(7.27 δ),3H (iv)A multiplet (7.75 δ),2H.
Predict the structure of the compound.