

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

Time: 3 Hours

Total Marks: 70

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

SECTION A

- 1. Attempt all questions in brief. 2 x 7 = 14**
- a. Calculate the bond order of N_2^+ .
 - b. Graphite is a good conductor of electricity. Why?
 - c. What do you understand by the term functionality of a polymer? Explain by taking an example.
 - d. Give reactions of lead-acid storage cell when it behaves like a galvanic cell.
 - e. Explain why a pure metal rod half immersed vertically in water starts corroding at the bottom?
 - f. What is calgon conditioning? Explain.
 - g. A sample of coal contains 60% Carbon, 33% Oxygen, 6.0% Hydrogen, 0.5% Sulphur, 0.2% Nitrogen and 0.3% Ash. Calculate GCV and NCV of coal.

SECTION B

- 2. Attempt any three of the following: 7 x 3 = 21**
- a. Explain Molecular Orbital Theory in case of metals and on its basis differentiate between conductors, semiconductors and insulators.
 - b. (i) Give preparation, properties and applications of BUNA N and Terylene.
(ii) Explain intrinsically conducting polymers.
 - c. (i) Give the construction and working of Galvanic cell.
(ii) Explain the different mechanisms of lubrication.
 - d. (i) A sample of water contains the following impurities:
 $Ca^{2+} = 20\text{ppm}$, $Mg^{2+} = 18\text{ ppm}$, $HCO_3^- = 183\text{ ppm}$ and $SO_4^{2-} = 24\text{ppm}$.
Calculate the lime and soda needed for softening.
(ii) Discuss the application of phase rule to water system.
 - e. (i) Calculate the minimum weight of air required for complete combustion of 1kg of fuel containing C = 90%, H = 3.5%, O = 3.0%, S = 0.5%, $H_2O = 1\%$, N = 0.5% and ash = rest.
(ii) Give the composition of biogas. With the help of diagram, explain a biogas plant.

SECTION C

- 3. Attempt any one part of the following: 7 x 1 = 7**
- (a) (i) Explain Schottky and Frenkel defects in crystals.
(ii) Give the properties and applications of fullerenes.
 - (b) (i) Explain why O_2 is paramagnetic in nature.
(ii) Give the applications of nanomaterials in electronics and medicine.
- 4. Attempt any one part of the following: 7 x 1 = 7**
- (a) What are Grignard reagents? How are they prepared? Give its applications.
 - (b) What are composite materials? Give the classification of composite materials.

5. **Attempt any *one* part of the following:** **7 x 1 = 7**
- (a) Discuss the electrochemical theory of corrosion along with equations. Explain why sheets of Zinc metal are hung around the ship hull of ocean going ships.
 - (b) Explain the manufacturing process of cement. Give the chemical composition of Portland cement along with its setting and hardening.
6. **Attempt any *one* part of the following:** **7 x 1 = 7**
- (a) Explain the Zeolite process of water softening? The hardness of 10,000L of a sample of water was removed by passing it through a zeolite softener. The zeolite softener then required 200 L of NaCl solution containing 150 gm/L of NaCl for regeneration. Find the hardness of water sample.
 - (b) Explain the terms phase, components and degree of freedom with examples.
7. **Attempt any *one* part of the following:** **7 x 1 = 7**
- (a) Explain the term chemical shift along with shielding and deshielding. An organic compound with molecular formula $C_3H_3Cl_5$ gave the following proton NMR data: (i) A triplet 4.52 δ 1H (ii) A doublet 6.07 δ 2H
 - (b) What do you understand by the terms GCV and NCV? Explain the construction and working of bomb calorimeter.