University Roll No.....

End-Term Theory Examination, 2018-19

B.Tech. I Year, II Semester

Engineering Chemistry (BCHS 0101)

Time: 3.0 Hr **Max. Marks: 50**

Section- A

Note: Attempt all questions. **7x5 = 35**

1. Applying the concept of Molecular orbital theory, explain the nature of bonding in Oxygen molecule by drawing its molecular orbital diagram, calculate bond order and predict its magnetic behavior.
2. **(a)** Determine the calorific value of a fuel using the principle of Bomb calorimeter.

   (b) Calculate the gross and net calorific value of a coal sample, containing 84% of carbon, 1.5% sulphur, 6% nitrogen, 5.5% hydrogen and 8.4% oxygen. (Given latent heat of steam = 587cal/gram)
3. **(a)** Differentiate thermoplastic and thermoplastic polymer.

   (b) Mention the composition, properties and industrial application of Borosilicate glass.
4. **(a)** What are boiler problems? Which of the following is more dangerous: Scale or Sludge

   (b) A Zeolite bed exhausted by softening 4000 L of water sample requires 10 L of 15% NaCl for regeneration. Calculate the hardness of water sample.
5. **(a)** Derive 'Henderson-Hasselbalch' equation to calculate the pH of a basic buffer.

   (b) Calculate the pH of a solution obtained by mixing 50 mL of 0.1M HCl with 50 mL of 0.2 M NaOH.
6. **(a)** Derive the integrated rate equation for first order reaction.

(b) For the second order reaction

$$CH_3COOH + NaOH \rightarrow CH_3COONa + C_2H_5OH$$

At 25^0C, $K = 6.21 \times 10^{-3}$ L Mol^{-1} Sec^{-1}. Calculate the time required for the hydrolysis of 85% ester of the initial concentration of the reactants in the following reaction mixture: (0.05M ester + 0.1M NaOH).

7. **(a)** State 'Piling-Bedworth' rule?

   (b) Make a blue print for corrosion control.

Section B

Note: Attempt all questions. **3x2 = 6**

1. Define the term Auxochrome and Chromphore in UV-Visible spectroscopy.
2. What is the range of Finger print region in IR spectroscopy? Highlight its significance.
3. What do you understand by equivalent and non equivalent proton? How many signals are obtained in NMR spectrum of the following compounds?

   (i) CH_3-O-CH_3 (ii) CH_3-CH_2-CH_2-COOH

Note: Attempt all questions. **3x2 = 6**

4. **(a)** Differentiate Order of reaction and Molecularity.

   (b) Calculate the energy of activation of a reaction, whose rate constant is tripled by 10 °C rises in temperature in vicinity of 27 °C.
5. What is Corrosion? Discuss the mechanism of absorption of O_2 type corrosion.
6. Discuss the various industrial applications of nanotechnology.