(Following Roll No. to be filled by candidate)

Roll No.

B.Tech.

FIRST SEMESTER EXAMINATION 2015-16

EAS102

ENGINEERING CHEMISTRY

Time: 3 Hours **Max. Marks: 100**

Note: Attempts all Questions. All Questions carry equal marks.

1. Attempt any four parts of the following. [4x5]

a. Calculate the bond order of $N2^-$, CO, NO and O_2^+?
b. An element having atomic mass 52, occurs in bee structure with cell edge of 288pm, d = 7.2gcm^{-3}. Calculate Avogadro's number.
c. What is Ziegler-Natta Catalyst? Give two examples. What is the significance of a catalyst in polymerization?
d. What is shielding and deshielding?
e. Why do we express hardness of water in terms of $CaCO_3$ equivalents
f. How much rust ($Fe_2O_3.3H_2O$) will be formed when 100 g of iron rod completely rusted away? (Molecular Weight of rust = 214).

2. Attempt **any four parts** of the following. [4x5]

a. What are phase rule equations? Explain the application of phase rule to one component system.
b. Differentiate between chemical corrosion and electrochemical corrosion.
c. Give the preparation and properties of
(i) Nylon -6 (ii) neoprene rubber (iii) SBR
d. Discuss the influence of temperature on reaction rate. How is the activation energy of a chemical reaction determined?
e. Explain the order and stability of primary, secondary and tertiary carbonation.
f. Calculate the maximum percentage of sulphur that can be present in vulcanized rubber. (Molecular weight of isoprene = 68)

3. Attempt **any two parts** of the following. [2x10]

a. Discuss the terms Carbocations, carbonanious, free radicals, electrophilic reagents and nucleophilic reagents.
b. Write mechanism of the following
(i) Cannizaro's reaction (ii) Aldol Condensation (iii) Haffman rearrangement

c. Write short notes on structure method of preparation, main properties and uses of (i) addition polymerization (ii) nylon c:6 (iii) plexiglass

4. Attempt **any two parts** of the following. [2x10]

a. Calculate the quantities of lime and soda needed for softening 2000 litres of hard water which analyzed as follows
Analysis of raw water: Ca^{++} =160 ppm, Mg^{++} = 72ppm, HCO_3^- = 732ppm, dissolved CO_2 = 44ppm, HCl = 7.3ppm
Analysis of treated water: $CO3^{2-}$ = 30ppm, OH^- = 17ppm
b. Describe how calorific value of a solid fuel is determined using bomb calorimeters.
c. Define the symmetry elements of a crystal. Explain the lattice plane and the unit cell in sodium chloride crystal.

5. Attempt **any four of** the following. [4x5]

a. On the basis of molecular orbital theory, explain why F2 is diamagnetic while O2 is paramagnetic? Calculate their bond orders.
b. What are conformational isomers? Discuss the conformational isomer of ethane.
c. What is optical activity? Give the stereo isomers of Tartaric Acids? How do you account for lack of optical activity in meso form and racemic mixture?
d. How will you distinguish between benzene and anthracene by UV spectroscopy.
e. Define chemical shift. What is the significance in determination of shuction of molecules?
f. Explain the advantage and disadvantage of the zeolite process for water softening?