Printed Pages:02 **Sub Code: KAS 202T**

Paper Id: 238072 **Roll No.**

B.TECH.
(SEM II) CARRY OVER EXAMINATION 2022-23
ENGINEERING CHEMISTRY

Time: 3 Hours ***Total Marks: 100***

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

SECTION A

1. Attempt *all* questions in brief. **2 × 10=20**

(a) Which have lower energy H_2or N_2?Explain with reason.
(b) What do you understand by metallic bond?
(c) Discuss the Beer's law.
(d) What do you understand by polarizability in Raman Spectra?
(e) Discuss the cathodic protection.
(f) Calculate the degree of freedom of water at its triple point.
(g) How the percentage of nitrogen can be calculated in coal?
(h) What do you understand by hardness of water?
(i) Write the name & structure of the monomers of the following : (i) Nylon 6 (ii) Buna-S
(j) What are graft polymers?

SECTION B

2. Attempt any *three* of the following: **10×3=30**

(a) Draw molecular orbital diagram of the N_2^+, N_2&N_2^{2-}molecular species. Also find bond orders and predict their magnetic behaviors. And arrange these species in ascending order of their internal energy.

(b) What do you understand by chromophores and auxochromes? Discuss the different types of electronic transitions. The % transmittance of an aqueous solution of unknown compound is 20% at 25°C and concn. **2×10^{-5}** at 300 nm. The length of the cell is 4 cm. Calculate the absorbance and molar extinction coefficient.

(c) What do you understand by cell and battery? Describe the construction of lead acid battery with the reaction occurring during charging & discharge.

(d) What do you understand by portable water? Discuss the process of reverse osmosis to convert sea water into fresh water.
A zeolite softner was 90% exhausted by passing 50,000 liters of hard water. The softner was regenerated by passing it through 150 litres of NaCl solution containing 5% of NaCl solution, calculate the hardness of water sample.

(e) Distinguish between:
(i) Thermosetting and Thermoplastic Polymers
(ii) Addition and Condensation Polymerization

SECTION C

3. Attempt any *one* part of the following: 10×1=10

(a) What iscrystal defects? What are the effects of crystal defects on its properties? Differentiate between Schottky defect&Frenkeldefect.

(b) What are allotropes? Discuss the preparation, structure, properties and applications of fullerenes.

4. Attempt any *one* part of the following: 10×1=10

(a) What do you understand by spectroscopy? Write the principle of IR spectroscopy and discuss the various vibrational modes for AB_2 type molecule. How can you distinguish the following with the help of IR spectroscopy: (i) Formic acid and ethyl alcohol
(ii) Formaldehyde and di-methyl ether

(b) What do you understand by scattering spectroscopy? Discuss in details Raman effect.In the Raman spectra, incident light having λ4830 Åand scattered light having λ4618 Å. Calculate the wavelength of light in cm^{-1} and explain the nature of lines (Stokes or anti-Stokes lines).

5. Attempt any *one* part of the following: 10×1=10

(a) Derive Nernst Equation? Determine the concentration of Cd^{2+} ions in the following electrochemical cell: $\mathbf{Zn \mid Zn^{2+}_{(0.1\ M)} \parallel Cd^{2+}_{(X\ M)} \mid Cd}$

[Given E^o_{Anode}= - 0.76 V; $E^o_{Cathode}$= - 0.40 V &E_{cell}= 0.3605 V at 298 K]

(b) Calculate the degree of freedom for saturated and unsaturated solution of NaCl. Discuss the phase diagram for water system.

6. Attempt any *one* part of the following: 10×1=10

(a) What is the importance of Lime-soda process? Calculate the quantity of lime (90% pure) and soda (85% pure) needed for softening of 20,000 L of water. The following impurities was found to contain as: $MgCO_3$=8.4 mg/l, $Ca(HCO_3)_2$=81 mg/l, $MgCl_2$=95 mg/l, $MgSO_4$=12 mg/l, H_2SO_4 =9.9 mg/l,KCl= 10.0 mg/l and $CaSO_4$=68 mg/l.

(b) What do you understand by proximate analysis of coal? Calculate GCV and NCV of coal having the following compositions; C = 85%, H = 8%, S = 1%, N = 2% and ash = 4% (Latent heat of water vapour = 587 cal/g).

7. Attempt any *one* part of the following: 10×1=10

(a) What do you understand by functionality & degree of polymerisation?
Give preparation, properties and applications of the following polymers:
(i) Nylon 6,6 (ii) Polyester

(b) Give the preparation of Grignard reagent. Why is it important in organic compound synthesis? Give the preparation of a variety of organic compounds by using Grignard reagent.