Exam.	**Back**		
Level	BE	Full Marks	80
Programme	BCE, BME, BGE	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Engineering Chemistry (SH403)

✓ Candidates are required to give their answers in their own words as far as practicable.
✓ Attempt All questions.
✓ The figures in the margin indicate Full Marks.
✓ Assume suitable data if necessary.

1. How does a basic buffer solution resist change in pH on the addition of small amount of acid or base? An acidic buffer solution of pH 4.8 has to be prepared from acetic acid of 2N and sodium acetate. What amount of sodium acetate should be added to 1L of acetic acid? Where, pKa for acetic is 4.74. [2+3]

2. a) What is meant by single electrode potential? How does it originate? What are the factors affecting the single electrode? [1+1+1]

   b) Calculate the emf for the following cell at 25°C, [2]

   $Sn(s)/Sn^{2+}(0.15M)//Ag^+(0.03M)/Ag(s)$, Where $E^0 Sn^{2+}/Sn = -0.14V$ &

   $E^0 Ag^+/Ag = +0.80V$

3. What are inhibitors? Describe the intermediate compound formation theory of catalysis with a suitable example. Point out criteria of catalysts used for industrial purpose. [1+3+1]

4. What are different water pollutants? Mention the different sources of water pollution, their adverse effects and possible remedies. [1+2+1+1]

5. a) How is ozone formed and depleted in nature? What are the consequences of depletion of ozone layer in the atmosphere? [2+1]

   b) Describe the adverse effects of air pollutants and their possible remedies. [2]

6. What is biodegradable polymer? Mention preparations and use of the following. [1+2+2]

   i) Polyurethane
   ii) Nylon-6,6

7. What is conducting polymer? Give the preparation and applications of: [1+2+2]

   i) Polyphosphazenes
   ii) Polymeric Sulphure nitride $(SN)_n$

8. Explain the following features of transition elements with reference to 3-d transition series (i) Alloy formation (ii) Complex formation. [2.5+2.5]

9. Write the possible oxidation states of Sc and Cr [1+2+2]

   i) $TiCl_3$ is colored compound but $TiCl_4$ is colorless compound. Explain
   ii) $K_4[Fe(CN)_6]$ is diamagnetic compound but $K_3[Fe(CN)_6]$ is paramagnetic. Explain

10. Show your familiarity with double salt, complex salts and ligands. How does Werner's theory explain the structure of complex compounds? [3+2]

11. a) Using valence bond theory, predict the geometry and magnetic properties of $[Ni(CN)_4]^{2-}$ and $[Co(NH_3)_6]^{2+}$ [1.5+1.5]

b) Write the IUPAC names of the following co-ordination compounds. [2]

    i) $[Na_3[Al(C_2O_4)_3]]$

    ii) $[Co(NH_3)_2(en)_2]Cl_3$

    iii) $K_3[Fe(C_2O_4)_3]$

    iv) $[Al(OH)(H_2O)_5]^{2+}$

12. What are explosives? Classify the explosives with respect to sensitivity. What are the impurities that you expect in crude product of TNT? [1+2+2]

13. a) What are the requisites of good paints? Write about enamels. [2.5]

b) What is meant by lubricant? Write about semi solid lubricants and their uses. [2.5]

14. a) What are geometrical isomers? Show your familiarity with E and Z configuration with suitable examples. [1+2]

b) Define Cis and trans isomers. Why is trans isomer more stable than Cis isomer? [2]

15. Define enantiomers, diasteromers, racemic mixture and meso compound with a suitable example of each. Also write their optical activity. [5]

16. Give an account of SN reactions. Explain the reaction mechanism for the reaction between 3°alkyl halide and aqueous NaOH. [2+3]

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