Engineering Chemistry
(CH-101, Dec.2005)

Time: 3 Hours   Max. Marks: 60

Note: Question No. 1 is compulsory. Attempt five questions from section A and B, taking at least two questions from each section.

Section-A
1. (a) What is demineralized water? How is it different from soft water?
    (b) Why does a part of nail inside the wood undergo corrosion easily?
    (c) What do you understand by NMR spectroscopy?
    (d) What do you understand by quantum yield?
    (e) What is function of salt bridge in an electrochemical cell?
    (f) What is condensed Phase Rule? When is it applied?
    (g) What type of nuclei show ESR spectra?
    (h) How is galvanization different from cathodic protection?
    (i) How scales are formed in boilers?
    (j) What do you mean by Retaintion factor (R_f)

Section-B
2. (a) Calculate the amount of lime (84% pure) and Soda (92% pure) required for treatment of 20,000 liters of water, whose analysis is as follows $Ca(HCO_3)_2$ = 40.5 ppm; $Mg(HCO_3)_2$ = 36.5 ppm; $MgSO_4$ = 30.00 ppm; $CaSO_4$ = 34.0 ppm; $CaCl_2$ = 27.75 ppm and NaCl = 10.00 ppm. Also calculate the temporary and permanent hardness of water.
    (b) What is principle of EDTA titration? Briefly describe the estimation of hardness of water by EDTA method.
3. (a) Explain "rusting of Iron" with the help of electrochemical theory of corrosion.
    (b) Write in brief about pitting and soil corrosion.
4   (a) How the performance of a particular chromatographic system can be assessed?
    (b) Write short notes on
              (i) Liquid Chromatography
              (ii) Classification of chromatography Methods
5. (a) Derive Nernst equation and give its significance
    (b) Write equations for each half reaction and calculate E_{cell} for the following concentration Zn/Zn^{++} (1.0M)//Zn^{++} (0.15M)/Zn as the cell discharges. Does the concentration of two solutions becomes smaller or larger?

Section-C
6. (a) Explain photosynthesis .
    (b) Give requirements of laser action.
    (c) Calculate the value of an Einstein of energy in electron volts for radiation of frequency 3×10^{15}.
7. (a) Define and explain the term "Degrees of freedom" of a system with suitable examples.
    (b) Draw a labeled phase diagram of water system and discuss the metastable curve and principles freeze drying.
8. (a) Explain the following
          (i) Intensities and line width of spectra
          (ii) Charge transfer transitions
    (b) Explain Beer-Lambert Law.
9   (a) What type of information is obtained by studying the UV, IR and H-NMR spectra of an organic compound?
    (b) How many NMR signals are observed in the spectrum of
    (i) CH_3COOCH_3
    (ii) $CH_3-CH_2-\lozenge-CH_2CH_3$
    (iii) CH_3OCH_3
    (iv) $CH_3CH_2CH_3$