(2 ½ Hours)   [Total Marks : 60

N.B.: (1) All questions are compulsory.
      (2) Use of log table or nonprogrammable calculator is permitted.

Q.1   A   Attempt any **Two** of the following   8
       i   Define: a) Representative sample   b) Systematic sampling
                    c) Random sampling   d) bulk material for sampling
       ii   What are the factors to be considered while selecting a method for
            analysis?
       iii What can be the reasons for incorrect analytical results? How can
            they be corrected?
       iv   What is record management? Why is it necessary?

       B   How is the sample register maintained? What are the points to be   4
            recorded regarding a particular sample in the register?
                                      OR
       B   What is quality control and quality assurance? What is their role in   4
            chemical industry?

Q.2   A   Attempt any **Two** of the following   8
       i   What is uncertainty of measurement? How the uncertainty of
            measurement can be put in use?
       ii   What is meant by signal to noise ratio (S/N) in the chemical
            analysis? What are the sources of noise in instrumental analysis?
       iii Why enhancing signal to noise ratio is important for the analysis?
            How is it done?
       iv   What is FDA? Explain its role in pharma and food industry?

       B   Three different quantities and their uncertainties are: 4
            a = 27.71, b = 32.35, c = 47.10 and the respective uncertainties are
            0.01, 0.02 and 0.11.
            If the final measurement is of type Y = a + b + c, calculate the
            combined uncertainty in the measurement of Y.
                                      OR
       B   The following data were obtained for the repetitive weighing of a   4
            1.045g standard weight on a balance:
            1.003, 1.000, 1.001, 1.040, 1.050, 1.006, 1.001, 0.999, 1.007
            Assuming that the noise is random, calculate the signal to noise
            ratio for the balance.

                                                        TURN OVER

Q.3　A　Attempt any **Two** of the following　　　　8
　　i　Give an account of Inorganic ion exchangers.
　　ii　Explain the selectivity of ion exchangers for cations and anions with the help of ion exchange equilibria.
　　iii　Why is suppressor column used in ion chromatography?
　　iv　Explain the apparatus for supercritical fluid extraction and discuss its applications with special reference to environmental analysis.

　　B　Calculate the amount of potassium and sodium taken up by 3.500 g of cation exchange resin with exchange capacity of 4.50 m mol / g of resin. (At wt of K = 39 and Na = 23)　　　　4

OR

　　B　Explain the concept of critical state and supercritical state of the matter.　　　　4

Q.4　A　Attempt any **Two** of the following　　　　8
　　i　What are the applications of exclusion chromatography?
　　ii　What is pressure programming? Why is it used in supercritical fluid chromatography?
　　iii　Discuss the principle of inverse gas chromatography. What are its applications?
　　iv　What is affinity chromatography? Explain the mechanism of separation of biomolecules by affinity chromatography.

　　B　Why CO_2 is the supercritical fluid of choice?　　　　4

OR

　　B　Differentiate between gel filtration and gel permeation.　　　　4

Q.5　　Attempt any **Four** of the following　　　　12
　　i　What is the significance of standard reference materials in chemical analysis?
　　ii　What is the importance of calibration of measurements?
　　iii　What are the hardware devices for noise reduction?
　　iv　What are the scheduled drugs?
　　v　Explain the liquid ion exchangers with suitable examples.
　　vi　What are chelating resins? How are they used for separation of inorganic compounds?
　　vii　Draw a schematic diagram of the set up used in the supercritical fluid chromatography.
　　viii　Describe the instrumental method of determination of molecular weight of polymer.

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