

Duration: 2 ¹/₂ Hrs

Total Marks: 60

- N. B.: 1. All questions are compulsory**
2. Figures to the right indicate full marks.

- Q.1) (A)** Attempt **ANY TWO** of the following: (8)
- (i) How is sample register maintained? Discuss the important points to be documented when a particular sample is registered.
 - (ii) Explain subsampling and storage of samples.
 - (iii) State the reasons for obtaining incorrect analytical results. How one can correct the results?
 - (iv) How is calibration of measurement done?
- (B)** Explain the “method validation” of analytical processes. (4)
- OR**
- (B)** Explain the importance of charting in analysis of result (4)
- Q.2) (A)** Attempt **ANY TWO** of the following: (8)
- (i) How does signal to noise ratio (S/N) affect the sensitivity and detection limit of the instrument?
 - (ii) Write a note on FDA and its role in pharma and food industry.
 - (iii) Explain the uncertainty evaluation process with reference to specification and identification
 - (iv) Explain the Boxcar Technique used to reduce noise.
- (B)** Three measurements and their uncertainties are as follows: (4)
- Measurement: $a = 11.38$, $b = 9.89$, $c = 10.29$
 Uncertainties: $a = 0.012$, $b = 0.011$, $c = 0.008$
 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 a current measurement in mA (4)
- on a noisy system : 15.86, 16.57, 18.09, 11.40, 15.91, 12.21, 15.85, 13.77, 11.85, 16.53
 Assuming that the noise is random, Calculate the signal to noise ratio of the system.
- Q.3) (A)** Attempt **ANY TWO** of the following: (8)
- (i) Explain the principle of Ion Chromatography with the help of instrumentation diagram.
 - (ii) Discuss the applications of supercritical fluid extraction method in food and environmental analysis.
 - (iii) Write a note on ‘Synthetic Ion Exchangers’

- (iv) Discuss the terms, ion exchange equilibrium and break through capacity of resin?
- (B) Elaborate the term critical and supercritical state of the matter. (4)
- OR**
- (B) Calculate the number of mili grams Na^+ and Ca^{+2} taken up by 5.250g of cation exchange resin with exchange capacity of 4.250 m mol/g of resin (At wt of Na= 23 and Ca=40) (4)
- Q.4) (A)** Attempt **ANY TWO** of the following: (8)
- (i) What is inverse gas chromatography? What are its applications?
 - (ii) How is affinity chromatography used in the separation of biomolecules?
 - (iii) Write a note on “Inorganic molecular sieves”
 - (iv) What is pressure programming? Why it is used in supercritical fluid chromatography?
- (B) What is the difference between gel permeation chromatography and size exclusion chromatography? (4)
- OR**
- (B) What are the types of columns and detectors used in supercritical fluid chromatography? (4)
- Q5)** Attempt **ANY FOUR** of the following: (12)
- (i) Give details of quality control in the laboratory.
 - (ii) Explain the importance of good laboratory practices.
 - (iii) Elaborate the term “Thermal Noise”
 - (iv) List the hardware devices used for noise reduction.
 - (v) Explain the role of suppressor column in Ion Chromatography.
 - (vi) Give an account of non-aqueous ion exchangers.
 - (vii) Describe the retention behaviour in exclusion chromatography.
 - (viii) Describe the instrumental method for the determination of molecular weight of polymers.
