Unique Paper Code	: 32177904
Name of the Paper	: DSE-Analytical Methods in Chemistry
Name of the Course	: B.Sc. (Hons.) Chemistry
Semester	: VI
Duration	: 3 hours
Maximum Marks	: 75

Instructions for the candidates:

- 1. Attempt any FOUR questions in all.
- 2. All questions carry equal marks.
- 1.

(5, 5, 5, 3.75)

- (a) During analysis of an analytical data, which statistical parameters are needed for ensuring the quality and reliability of data? Explain any two with proper examples?
- (b) What are the types of errors in chemical analysis? How do they enter in any instrumental analysis? What are the ways to minimize them?
- (c) Classify various types of sampling methods in analytical chemistry. Why sampling is important in chemical analysis? Explain different steps involved during sampling.
- (d) Define significant figures. How many significant figures does each of the following numbers have?
 - $\begin{array}{ll} (i) & 1.6350 \\ (ii) & 0.0541 \\ (iii) & 2.5 \times 10^6 \end{array}$
- 2.

(5, 5, 5, 3.75)

- (a) How a single beam spectrophotometer is different from double beam spectrophotometer in terms of sample holder? Explain with the help of a block diagram. Explain the importance of monochromator in UV-Visible spectrophotometry?
- (b) How Lambert-Beer's law helps to analyze metal ion, both qualitatively and quantitatively in an alloy sample? Explain the standard addition method?
- (c) An aqueous solution of a substance X shows 80 % transmittance at 500 nm in a 1.0 cm cell. If the molar absorptivity of this substance at this wavelength is 4×10^4 mol⁻¹Lcm⁻¹, what is the concentration of the solution?
- (d) Explain the origin of spectra for UV- Visible spectroscopy. Why absorbance has no unit whereas absorptivity has?

- (a) Describe the various atomization techniques used in atomic absorption spectroscopy (AAS). What are the various oxidants used in AAS? How does the combination of fuel gases and oxidants affect the temperature?
- (b) Explain the various processes that occur when a sample is injected into the flame in flame photometry. What are the methods of background correction in flame photometry?
- (c) State the principal involved in TGA, DTA and DSC thermal analysis techniques. Give nature of thermograms in all three techniques.
- (d) Explain the effect of the following on the thermogravimetric results: (i) rate of increase of temperature in the furnace (ii) nature of atmosphere in the furnace and (iii) particle size of the sample?

4.

(5, 5, 5, 3.75)

(a) Explain the nature of the graphs obtained in the conductometric titration of

(i) Strong acid against Strong base

(ii) Mixture of Strong acid and weak acid against Strong base

- (b) Define pH. Explain the working of a glass electrode employed for the determination of pH of an analytical sample.
- (c) Draw and explain a typical arrangement for a potentiometric titration. Give the names of two electrodes used in potentiometric titrations.
- (d) The initial weight, 150 mg of a compound of magnesium was decreased to 54 mg when subjected to thermal analysis. Find out whether the compound is an oxide, carbonate or an anhydrous oxalate of magnesium?

5.

(5, 5, 5, 3.75)

- (a) What are chromatograms? Discuss the frontal, elution and displacement methods of development of chromatograms.
- (b) Define chromatography. Explain the following terms used in chromatographic analysis:
 - (i) Retardation factor(ii) Retention time(iii) Resolution of a chromatographic separation

Suggest any two methods for improving the resolution of a chromatographic separation.

(c) Discuss the various equilibrium processes in the solvent extraction of metal ion from an aqueous phase by solvation.

3.

A substance A is 99.0 % extracted from its 80 ml aqueous solution using 30 ml of an (d) organic solvent. Calculate the distribution ratio.

6.

 $(3 \times 5 = 15, 3.75)$

- Write short notes on (any three): (a)
 - (i) Adsorption and Partition chromatography
 - (ii) Cation and anion exchange resin
 - Photomultiplier tube (iii)
 - Confidence interval and confidence limit (iv)
 - Q Test for the rejection of a data point (v)
- (b) Differentiate between (any one):
 - (i) Prism and gratings
 - (ii) F-test and t-test