(3 Hours) Total Marks: 75

N. B. (1) All questions are compulsory.
(2) Use of log tables or non-programmable calculator is permitted.
(3) Figures to the right indicate full marks

Q.1. Attempt any **Five** of the following **15**
(a) Discuss the role of research & development section in chemical industry.
(b) What is the use of standard reference material in chemical analysis?
(c) Write note on – "solid phase micro-extraction".
(d) How is pre-concentration achieved in supercritical fluid extraction?
(e) What is the role of suppressor column in ion chromatography?
(f) Explain in brief the terms "exclusion limit" and "permeation limit".
(g) Give any three applications of nano materials.
(h) Draw the flow sketch and discuss C, H, N analyzer

Q. 2. (a) What is the criteria for selection of instrument for analysis? **5**
OR
(a) Explain the factors that determine the uncertainty in simple acid base titration **5**
(b) What is quality audit? How is it carried out? **5**
OR
(b) What is signal to noise (S/N) ratio? What are the hardware techniques **5**
useful for reduction of S/N ratio?
(c) A noisy pH meter shows the following values for a solution on ten repetitive **5**
measurement: 7.95, 7.93, 7.88, 8.09, 7.92, 8.10, 8.06, 7.95, 8.03 and 7.88
Assuming that the noise is random, calculate the signal to noise ratio for the pH
meter.

Q. 3. (a) Explain reverse osmosis. Give its application **5**
OR
(a) How is centrifugal extraction used in biotechnological applications? **5**

(b) Discuss the advantages and applications of supercritical fluid extraction **5**
OR
(b) What is ultrafiltration? How it differs from microfiltration? **5**

(c) A 96% of solute is removed from 50 cm^3 of aqueous solution by extracting with **5**
two 25 cm^3 portion of an organic solvent. What is the distribution ratio of the
solute? If more than 99.0% of a solute is to be removed, how many extractions
should be carried out with 25 cm^3 of the organic solvent?

Q. 4. (a) Attempt any **Two** of the following   **10**

   (i) How does the heavy metals in sea water separated using chromatographic
        Method?
   (ii) Explain the need of pressure programming in supercritical fluid chromatography.

   (iii) What is inverse gas chromatography? How is it different from other?
          chromatographic techniques?
   (iv) Describe affinity chromatography as a separation technique with a suitable
        example.

   (b) A strong acid ion exchanger has an exchange capacity of 4.12 m mol / g of resin,   **5**
        Calculate the amount of K^+ and Mg^{2+} that will be taken up by 4.00 g resin.
        [At. Wt. K^+ = 39 and Mg^{2+} = 24.3]

Q.5.   Attempt any **Three** of the following   **15**
   (a)   Discuss in detail any two properties of nano materials.
   (b)   What are the advantages of automated analysis over discrete analysis?
   (c)   Discuss the factors that affect zone electrophoresis.
   (d)   Describe the application of multilayered films with reference to the determination of
         glucose in blood. Explain the role of different membranes used in it.
   (e)   Explain the detection of an analyte in the case of capillary gel electrophoresis.