[Time: 2\frac{1}{2} \text{ Hours}]  

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

Q. 1  
A) Attempt ANY TWO of the following: (08)
   i) Define sampling. Explain the criteria for the acceptance or rejection of sample.
   ii) State the reasons for obtaining incorrect analytical results.
   iii) Explain validation of analytical method. Give its importance.
   iv) Write a note on pre-treatment of cosmetic samples.
B) Attempt ANY ONE of the following: (04)
   i) Explain the dissolution technology used for sample preparation.
   ii) What performance criteria are used for the selection of the method of analysis?

Q. 2  
A) Attempt ANY TWO of the following: (08)
   i) How does the signal to noise ratio affect the detection limits? Enlist the sources of instrumental noise.
   ii) Write a note on: significance of GMP in pharmaceutical manufacturing processes.
   iii) Explain the terms: Drug Rules and Drug Act
   iv) Describe the hardware devices for noise reduction
B) Attempt ANY ONE of the following: (04)
   i) Three measurements and their uncertainties are as follows: 
      Measurement: \(a=12.39, b=9.38, c=10.17\) 
      Uncertainties: \(a=0.015, b=0.012, c=0.009\)
      If the final measurement is of type \(Y=a+b+c\), calculate the combined uncertainty in the measurement of \(Y\).
   ii) The following data were obtained for a current measurement in mA 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: (08)
   i) Explain the selectivity of ion exchangers for cation and anion on the basis of ion exchange equilibria.
   ii) Discuss the principle and applications of Ion Chromatography.
   iii) Write a note on Exclusion Chromatography.
   iv) Give an account of use of chelating resins for separation of inorganic and organic compounds.
B) Attempt ANY ONE of the following: (04)
   i) Explain the use of suppressor column in Ion Chromatography.
   ii) Calculate the amount in “mg” of sodium and calcium retained by 5.250 g of cation exchange resin with exchange capacity of 4.250 m mol/g of resin (At wt of Na= 23 and Ca=40)

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Q. 4  
A) Attempt ANY TWO of the following:  
i) With the help of schematic diagram, explain the instrumentation for super critical fluid chromatography.  
ii) What is Affinity Chromatography? Explain the mechanism for separation of biomolecules by affinity chromatography.  
iii) Write the principle and working of OPLC.  
iv) Explain the critical state and super critical state of the matter.  

B) Attempt ANY ONE of the following:  
i) What is pressure programming? Why is it used in super critical fluid chromatography?  
ii) Give the applications of OPLC.

Q. 5  
Attempt ANY FOUR of the following:  
i) Explain sub-sampling and storage of samples.  
ii) How are intermediates and finished products sampled?  
iii) Give a brief account of environmental noise.  
iv) What is uncertainty? How is it evaluated?  
v) Explain the inorganic ion exchangers with suitable examples.  
vi) Describe the instrumental method of determination of molecular weight of polymer.  
vii) Explain the application of super critical fluid chromatography in food and pharmaceutical analysis.  
viii) Explain the instrumentation of Affinity Chromatography.