TIME: 2 HOURS **MAX. MARKS: 50**

NB:

1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**
3) **Use of logarithmic table/non-programmable calculator is allowed.**
4) **At. Wts: H=1, C=12,N=14,O=16,Na=23,Al=27,S=32, Cl=35.5, K=39, Ca=40,Ag=108 , Ba=137, Pb=207,Mg= 24.3,F=19,Cu= 63.5, Cr = 52, Sn=118.7 Fe = 55.8**

Q.1 Answer **any two** of the following: 10

A. Define the terms:
a) Measurement b) Technique c) Protocol d) Analyte e) Matrix

B. What is Kaizen? Explain the six steps involved.

C. Discuss quantitative method of analysis with respect to calibration curve method.

D. Write note on basic safety in laboratory.

Q.2 Answer **any two** of the following: 10

A. Calculate the pH of a 0.1 M NH_4OH solution. Given $K_b = 1x10^{-5}$.

B. How much volume of a 1000 ppm K^+ solution, using KCl, is required to prepare 100 cm^3 of 0.02 M KCl solution.

C. 16.98 g of $AgNO_3$ is treated with 6.5 g of NaCl, producing AgCl. Calculate the amount of AgCl produced, in grams. Which is the limiting reagent?

D. Determine the mole fraction of both the substances, when 45 g of acetone is mixed with 55 g of methanol.

Q.3 Answer **any two** of the following: 10

A. Describe the use of Nernst Glower and the Globar in IR spectroscopy.

B. Write short note on Near and Far region of IR spectra.

C. In what way the Fourier Transform (FT) instruments differ from the optical instruments?

D. Describe the effect exerted by the pH and solvents on the λ_{max} values in the absorption spectroscopic technique.

Q.4 Answer **any two** of the following: 10

A. With the help of schematic diagram, discuss any one Differential Scanning Calorimetry (DSC) instrument.

B. Discuss the applications of DSC for:

a) Drug analysis

b) Safety screening

C. Discuss the factors affecting DSC curves.

D. Describe the role of multilayered films in automated analysis.

Q.5 Answer **any five** of the following: 10

A. Define the figures of merit of Analytical methods:
a) Robustness b) LOD

B. What is significance of government standards like HALLMARK and ISI.

C. Solid $PbSO_4$ is dissolved in water at 25°C. Its solubility is 1.25×10^{-4} mol/dm^3. Calculate the solubility product (K_{sp}) of the compound.

D. Assign oxidation number to each element in $Cr(OH)_4^-$

E. Draw a schematic of optical arrangement of a dual wavelength spectrophotometer.

F. Describe any one method of sample preparation in recording IR spectra.

G. Draw the schematic DSC thermogram, show the glass transition, exothermic and endothermic peaks.

H. Enlist any four objectives of automation.

****