3 hours　　　　　　　Total marks 80

NB.　(1) All Questions are **compulsory**
　　　(2) Figures to the **right** indicate **full** marks.
　　　(3) Answer all sub questions together
　　　(4) Draw neat labeled diagrams wherever necessary

Q1　(a)　Name the following(**Any six**)　　　　　　　　　　　　6
　　　i　One UV multi-component analysis technique where absorbance is taken at
　　　　λmax of one component and at isobestic point of the two components in the
　　　　multicomponent formulation
　　　ii　One reference standard used in ^{1}H NMR spectroscopy
　　　iii　Splitting pattern of methylene protons in ethanol
　　　iv　Two supercritical fluids
　　　v　Two normal phase stationary phases
　　　vi　Chromatographic term related to minimum retention of component for HPLC
　　　　analysis
　　　vii　The peak with highest m/z value in the mass spectrum

　　(b)　Explain the following terms (**Any four**)　　　　　　　　8
　　　i　MALDI-TLC
　　　ii　Gradient elution
　　　iii　UPLC
　　　iv　Isotope abundance
　　　v　TMA

　　(c)　Answer the following(**Any three**)　　　　　　　　　6
　　　i　Draw diagrams to depict anisotropic effect in acetaldehyde and ethyne
　　　ii　A mixture of compounds X, Y and Z was separated on 10 cm silica gel
　　　　HPTLC plate. Solvent front was allowed to run up to 9cm.If X, Y and Z
　　　　travelled distances of 2cm, 7cm and 5cm respectively, arrange them in
　　　　increasing order of polarity. Justify your answer.
　　　iii　Differentiate between UV detector and refractive index detector based on type
　　　　of analytes analyzed and sensitivity
　　　iv　Draw diagram to depict dead time and retention time in the chromatogram

Q2　　　Answer the following (**Any three**)　　　　　　　　　12

　　a　Discuss the principle involved in the separation of compounds by chiral
　　　chromatography by mobile phase additives.
　　b　Give a brief account of instrumentation in gel electrophoresis
　　c　With reference to HPTLC technique, explain the term fingerprinting and its
　　　use in herbal analysis
　　d　Give the significance for analysis of residual solvents in bulk drugs. Explain
　　　the working of headspace analysis.
　　　　　　　　　　　　　　　　　　　TURN OVER

Q3   Answer the following (**Any three**)   12

    a   Explain HETCOR technique with a suitable diagram
    b   Give the number of signals and the splitting pattern of all sets of protons in the
            ^{1}H NMR spectrum of n propanol
    c   With the help of suitable example explain how a doublet of doublet is formed
    d   Enlist methods used to make complex NMR spectra simple. Explain any one
            in detail

Q4   Answer the following (**Any three)**   12

    a   What is the significance of interface used in the LC-MS techniques? Explain
            any one interface used in the LC-MS technique
    b   With the help of suitable diagram, explain the construction and working of ion
            cyclotron mass analyzer
    c   Depict two fragmentation pathways for n propyl benzene
    d   Enlist 2 reagent gases used in Chemical Ionization. State one advantage and
            one disadvantage of chemical ionization technique

Q5   Answer the following (**Any three**)   12

    a   Describe how difference spectroscopy is carried out. State two conditions to be
            fulfilled for difference spectroscopy to be applied for analysis of a drug in a
            formulation
    b   Explain in detail the simultaneous equations method for analysis of a
            multicomponent formulation
    c   Draw a labeled block diagram to depict instrumentation of Thermal
            Gravimetric analysis. Discuss any two factors which affect a
            thermogravimetric curve
    d   Explain the working involved in DSC analysis. Name 2 exothermic and 2
            endothermic processes related to DSC scan.

Q6   Answer the following (**Any three**)   12

    a   With the help of suitable diagram explain the construction and working of
            FTIR
    b   Assign which IR vibrations are associated with the following wave numbers
            (any four)
            2960, 1600, 1450,1680, 1100 cm^{-1}
    c   Discuss principle involve in Transmission Electron Microscopy
    d   The retention time of a compound when analyzed on 25 cm HPLC column is 9
            min. The peak width at the base is 0.43 min
            Calculate: i. The number of theoretical plates. ii. Plate height.