Q.P. Code : 24108

(2½ Hours) **[Total Marks :60**

N.B. : (1) **All** questions are **compulsory**
(2) Use of **log table** or nonprogrammable **calculator is permitted.**

1. (a) Attempt **any Two** of the following : **8**
(i) Explain the behaviour of a charged rotating particle in a magnetic field with suitable example.
(ii) Discuss the role of pyroelectric transducer in infrared spectroscopy.
(iii) Explain chemical shift and spin-spin coupling with respect to NMR spectroscopy.
(iv) What is the significance of, group frequency region and finger print region, in qualitative analysis of organic compound by IR spectroscopy?

(b) Explain principle of Two-Dimensional Fourier Transform NMR. **4**

OR

(b) Give an account of infrared sources along with their functions in infrared spectrometer. **4**

2. (a) Attempt **any Two** of the following : **8**
(i) What is function of ion sources and mass analyzers in mass spectrometer?
(ii) Explain the method of handling liquid and solid samples in Raman spectroscopy.
(iii) Discuss the use of mass spectrum for structural information from fragmentation pattern.
(iv) Explain the mechanism of Raman and Rayleigh scattering.

(b) Calculate the magnetic flux density that is required to focus a C_4H_9+ ion on detector in mass spectrometer in which the accelerating potential is maintained at 200KV and radius of curvature of the focused ionic beam at the exit slit is 30.0cm. **4**

OR

(b) Explain qualitative and quantitative analysis of organic species on the basis of Raman spectra with suitable examples. **4**

8

3 (a) Attempt **any Two** of the following :

(i) Discuss the advantages and disadvantages of the thermal neutron activation analysis.

(ii) Explain the principle and working of thermometric titration with suitable example.

(iii) Discuss the applications of DTA.

(iv) What are radiometric titrations? Explain the titration and nature of the curve obtained in the determination of chloride ions using this technique.

(b) In thermal analysis methods, why is the thermocouple for measuring sample temperature immersed directly into sample? 4

OR

(b) Describe direct and substiochiometric isotope dilution method in detail. 4

8

4 (a) Attempt **any Two** of the following :

(i) Give applications of GC-IR.

(ii) What are hyphenated techniques? Explain the need of hyphenation.

(iii) Explain the interfaces used in GC-MS and give application of GC- MS.

(iv) How can HPLC be coupled with MS? How is this coupling carried out?

(b) Explain the interface used in ICP-MS and discuss the advantages of using mass spectrometer as detector. 4

OR 4

(b) Give the principle and working of MS-MS.

5 Attempt **any Four** of the following : 12

(i) What are the difficulties involved in the analysis of evolved gases during thermal decomposition by GC?

(ii) Give the basic factors that affect the induced radioactivity during neutron activation analysis.

(iii) Explain the instrumentation used in DSC.

(iv) Discuss the principle and working of ICP-OES.

(v) Why do double focusing mass spectrometers give narrower peaks and high resolutions?

(vi) Under what circumstances could helium/neon lesser is perferred to an argon ion layer as a Raman source?

(vii) Describe the stretching and bending vibrations of molecules with suitable diagram.

(viii) Discuss the applications of C^{13} NMR.
