

QP Code : **BV-14998**

(2½ Hours)

[Total Marks :60

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

1. (a) Attempt any two of the following:— 8
- What is the significance of group frequency region and finger print region in qualitative analysis of organic compounds by IR spectroscopy?
 - Discuss the applications of Near-IR absorption spectrometry.
 - Explain the behaviour of a charged rotating particle in a magnetic field with a suitable diagram.
 - Give the applications of NMR in quantitative analysis of the compounds?
- (b) Explain the basic principle of IR spectroscopy.

OR

- (b) What is C^{13} NMR? What are its advantages over normal NMR?

2. (a) Attempt any two of the following:— 8
- Explain the origin of metastable peaks in mass spectroscopy.
 - Discuss the applications of mass spectroscopy with respect to determination of molecular formulae from molecular weight.
 - Explain the method of sampling using optical fibres used in Raman spectroscopy with a suitable diagram. 4
 - Describe the working of FT Raman Spectrometer with a schematic diagram.
- (b) For carbon tetra chloride the data for stokes and anti-stokes lines were obtained after irradiation of a sample with a He-Ne laser of 632.8 nm and 641.7 nm. Calculate Raman shift in cm^{-1} . 4

OR

- (b) What is the function of ion sources and mass analysers in mass spectrometer? 8

3. (a) Attempt any two of the following:—
- What is meant by substoichiometry in IDA? What are the requirements for tracers employed in this technique?
 - Discuss the advantages and disadvantages of thermal neutron activation analysis?
 - How are simultaneous thermal analysers superior to the individual instruments? 4
 - Describe the working of instrument used in the differential thermal analysis with a suitable diagram. 4
- (b) Describe the different types of thermometric titrations with suitable examples. 4

OR

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

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4. (a) Attempt any two of the following:—

- (i) Explain the interfacing devices used in GC-MS. How is it ensured that the carrier gas is removed from the sample components? 8
 - (ii) How can HPLC be coupled with MS? What are the interfaces available for this purpose?
 - (iii) How is the tandem mass spectroscopic technique used to identify compounds having same mass but different structures?
 - (iv) What are the advantages of using mass spectrometer as the detector? Explain the interface used in ICP-MS.
- (b) Describe the light pipe used in GC-IR instrument.

OR

(b) Give the principle and working of ICP-OES. 4

5. Attempt any four of the following:—

- (i) Describe the stretching and bending vibrations of molecules with a proper diagram. 12
- (ii) Explain the following terms:
 - (a) Chemical shift
 - (b) Spin-spin coupling
- (iii) Discuss the principle and working of a mass spectrometer.
- (iv) Give an account of surface-enhanced Raman spectroscopy.
- (v) Define autoradiography and explain how it is carried out for a metallurgical specimen.
- (vi) What is differential scanning calorimetry? Explain the instrument used in this technique.
- (vii) What is hyphenation? why is it required? what are its advantages?
- (viii) What is tandem mass spectrometry? What is the interface used in it? What are its advantages over mass spectroscopy?