Sl. No.	:	1469	F-7
Unique Paper Code	:	1141302	
Name of the Paper	:	Polymer Characterization	
Name of the Course	:	B.Tech (Polymer Science)	
Semester	:	III	
Duration	:	3 hours	
Maximum Marks	:	75 Marks	

Instructions for Candidates :

1. Write your Roll No. on receipt of this question paper.
2. Attempt **five** questions in all.
3. Question No. **1** is compulsory.
4. Use of simple calculator is allowed.

1.

(a) Explain the term molecular spectra with a suitable example?

(b) Discuss the interaction between electron beam and polymer samples.

(c) Calculate the no. of fundamental molecular vibrations in linear and non linear molecules with example.

(d) Explain shielding and deshielding effects in NMR spectroscopy.

(e) Describe the application of XRD in size estimation.

(f) What is uncertainty in a spectral results?

(g) Write a short note on emission spectroscopy.

(h) SEM has better resolution than optical microscope. Why?

(i) Write a note on a measuring procedure of amorphous character of a polymer?

(9 x 3)

2.

(a) Describe theory of Electron Spin Resonance spectroscopy.

(b) Calculate the frequency of an unpaired electron of a molecule present in magnetic field of strength 0.35T (g =2).

(c) Indicate the kinds of protons and number of PMR signals in the following compounds:

(i) $CH_3CH_2CH_2Cl$ (ii) $CH_3CHClCH_3$

(iii) CH_3COCH_3

(5 + 4 + 3)

3.

(a) Compare Raman and IR spectra also explain the Raman Shift?

(b) A sample gives a stoke line at 4458 A^o when the excited radiation of wavelength 4358 $A^o$is used. Deduce the wavelength of the anti-stokes line in A^o.

(c) Outline the fundamental modes of vibration of CO_2 and predict which of these modes will be IR active and which will be Raman active.

(5 + 4 + 3)

4.

(a) Discuss the principle and instrumentation of UV spectroscopy and its application in estimating of isotopes and chain length of polymers.

(b) Which of the following will show ESR spectra and why?

(i) Benzene, C_6H_6 (ii) Benzene anion, $C_6H_6^-$

(iii) Cyclopentadienylcation, $C_5H_5^+$

(iv) Cyclopentadienylanion, $C_5H_5^-$

(c) Discuss the important differences between HPLC and Gas Liquid Chromatography in brief. **(5 + 4 +3)**

5.

(a) Describe instrumentation of IR spectroscopy in detail with a schematic diagram.

(b) Explain the factors affecting vibrational frequencies with suitable examples.

(c) A hydrocarbon containing 10% hydrogen shows the following bands in its IR spectrum:

(i) 3295 cm^{-1} (ii) 2130 cm^{-1} (iii) 625 cm^{-1}

Deduce the structure and types vibration of the hydrocarbon.

(5 + 4 + 3)

6.

(a) Differentiate between blue and red shifts.

(b) Explain retention factor. How can it be measured by paper chromatography?

(c) State the use NMR for evaluation tactility in polymers with suitable examples.

(5 + 4 +3)

7.

Write a short note on (any three)

(a) Hyper chromic shift
(b) Retention time
(c) Gel permeation chromatography.
(d) Atomic spectra

(4 X 3)