This question paper contains 3 printed pages]

Roll No.

S. No. of Question Paper : **1616**

Unique Paper Code : **1141302**   F-3

Name of the Paper : **Polymer Characterization**

Name of the Course : **B.Tech. (Polymer Science)**

Semester : **III**

Duration : **3 Hours**   Maximum Marks : **75**

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt *Five* questions in all.

Question No. 1 is compulsory.

Draw neat and labelled diagram wherever necessary.

1. (*a*) Explain the basic principle of spectroscopy.

   (*b*) What is Retention factor ? How can it be measured by paper chromatography ?

   (*c*) Explain the shielding and deshielding effect in NMR spectroscopy.

   (*d*) Which of the following monomers can be measured in IR spectra ?

   (*i*) H_2O

   (*ii*) HCl

   (*iii*) Oxygen.

P.T.O.

(e) Compare the number of the lines in ESR spectra of the radicals X^1H_2, X^2H_e when X has a spin of 5/2.

(f) Write a note on measuring of yellowness index.

(g) Crystallinity and opacity are interdependent properties. Justify.

(h) Differentiate different types of errors.

(i) Explain the role of IR in study of polymer degradation with suitable example. 9×3=27

2. (a) Explain the principle, instrumentation and application in polymer testing of NMR spectroscopy. 8

(b) Find the frequency at which a proton NMR spectrometer should be operating under a magnetic field 1.8 T ($g = 2.7245 \times 2$ and $\mu_N = 5.0504 \times 10^{-27}$ JT^{-1}). 4

3. (a) What is X-ray diffraction ? Explain the principle and application of XRD in polymer characterization. 8

(b) Write a short note on Lambert-Beer's law. 4

4. (a) What is Raman effect ? Explain the principle of Raman spectroscopy. Discuss the merits and demerits of Raman spectroscopy over IR spectroscopy. 8

(b) Write a note on chemical ionization. 4

5. (a) Discuss the experimental techniques and applications of ESR. 6

(b) Calculate the no NMR signal and intensity ratio in the following molecules :   6

(i) Cyclohexane

(ii) Pyrrol

(iii) Benzene.

6. (a) Explain the principle and application of Transmission Electron Microscopy for characterization of polymers.

6

(b) Explain the different types of transition of UV-Visible light with suitable example.   6

7. Write short notes on any *three* :

3×4=12

(a) Paper chromatography

(b) Optical microscope

(c) Thin layer chromatography

(d) Chemical shift.