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Candidate's Seat No : \_\_\_\_\_

**M.Sc. (Sem.-II) Examination**

**409**

**CHEP : Analysis and Characterization of Polymers**

**Time : 3 Hours]**

**May-2017**

**[Max. Marks : 70**

**Q1. Answer the following:**

**14 marks**

(a) Describe the method for the determination of molecular weight by End Group Analysis.

OR

(a) Enlist colligative properties of polymer. Discuss in detail the method for the determination of molecular weight by Osmometry.

(b) Explain (i) Light Scattering Technique (ii) Molecular Weight Distribution Curve

OR

(b) How Mark-Houwink equation helpful to determine molecular weight? Explain viscosity average method in detail.

**Q2. Answer the following:**

**14 marks**

(a) Discuss in brief the two thermal analysis techniques namely DTA and DSC for the characterization of polymers.

OR

(a) Explain the principle and working mechanism of TMA with a neat and labelled diagram.

(b) Name different properties of a polymer which can be characterized using DMA?-Explain in detail.

OR

(b) Describe the working mechanism of TGA with a labelled block diagram.

**Q3. Answer the following:**

**14 marks**

(a) Discuss the importance of X-Ray diffraction with special reference to characterization of polymers.

OR

(a) Name the techniques which characterize the surface morphology of polymers. and explain how they differ from each other.

(b) Discuss the significance of UV and FTIR techniques for the characterization of polymers.

OR

(b) Draw the  $^1\text{H}$  NMR for 1,3-butadiene (cis and trans). Give types of proton and  $^{13}\text{C}$  present in these monomers.

(P.T.O)

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**Q4.** Answer the following:

**14 marks**

- (a) Explain the methods for the determination of total alkalinity and KOH number of rubber.

OR

- (a) Describe the methods for the determination of dry rubber content and volatile matter for rubber.

- (b) Define epoxy equivalent and epoxy value. How they are different from each other? Describe a method for the calculation of epoxy equivalent.

OR

- (b) Explain the process to calculate acid value and hydroxyl value of resins.

**Q5.** Answer in brief: (1 mark each)

**14 marks**

- a. Give the limitations of AFM.
- b. Give some important applications of GPC.
- c. Enlist the two important limitations of Lambert Beer's law.
- d. Give types of  $^{13}\text{C}$  for Styrene and Xylene.
- e. Define mechanical stability and heat stability of rubber.
- f. Explain curing of epoxy resin.
- g. What is meant by Glass Transition Temperature ( $T_g$ )?
- h. Define Isocyanate Index.
- i. What is spin-spin coupling in NMR spectroscopy?
- j. Name the materials used for GC column.
- k. How will you determine total solids of rubber?
- l. Name any two ionization techniques used in Mass Spectrometry.
- m. What is Co-polymerization?
- n. Define Degree of Crystallinity.