SEMESTER-IV

3. Polymer Testing and Characterization

Time: 3 Hrs. M.M. 100 marks

Note: The paper will be divided into two sections.

Section-A M.C.Q.50 (10 from each section) **Total-50 marks**

Section-B: Two questions are from each unit will be asked with internal choice and the candidate is required to attempt five questions. **Total-50 marks**

Unit – I

Chemical Characterization: Identification of materials by thermal, elemental and solubility analysis. Identification by colour tests. Estimation of specific chemical characteristics like acid number, saponification value and hydroxyl values. Solvent extraction and its analysis for polymers.

Unit – II

Thermal Characterization: Study of the instrumentation and application of the following techniques to polymer – TGA, DTA, DSC and TMA.

Unit – III

Spectroscopic Characterization: Basic principles, instrumentation and applications of the following techniques – UV and Visible, IR, FTIR with ATR, HPLC, GPC and GC-MS.

Unit – IV

Tests on unvulcanized mixes: Money Viscosity, Tel Tack, Dispersion, Scorch and cure rate.

Tests on vulcanized stocks: Tensile stress strain, compression stress strain and shear stress strain, hardness, abrasion, flex cracking and cut growth, fatigue, creep and stress relaxation, set, resilience, dynamic tests, heat build up, low temperature tests, resistance to liquids, resistance to heat, air, ozone, permeability, resistively, relative permittivity, power factor, dielectric strength, peel test, rubber to textile adhesion and rubber to metal adhesion.

Unit – V

Testing and characterization of polymer Products: Identification of elastomers by spot tests, extract analysis, total sulfur, organic sulfur, inorganic sulfur, free sulfur and filler analysis. Determination of elastomers by direct method, estimation of NR, SBR, NBR and IIR. Stress – strain tests, determination of Melt flow index (MFI).

Brief knowledge about Non-destructive tests: X-ray, Uniformity and Holography.

Recommended Books:

1. Physical testing of rubbers: R. P. Brown.
2. Rubber Technology and Manufacturing: C.M. Blow.
3. Introduction of Polymer Sc. & Rubber Technology, Vol. I, Ed. By Dr. R. Mukhopadhyay.
4. Spectrometric Identification of Organic Compounds:
Silverstein. 4. Vogel's Text Book of Quantitative Chemical
Analysis.
5. Analysis of Rubber and Rubber like Polymers: Wake, Tidd and
Loadman. 6. Vogel's Textbook of Quantitative Chemical Analysis.