

SEMESTER-III
2. Polymer Processing Technology

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

Mixing: Introduction, Material flow to the mixer, feeding, weighing and charging of materials.

Mixing process: Incorporation, dispersion, distribution and plasticization.

Internal mixer operation: Mixing procedure, temperature control, rotor speed, ram pressure, batch size, dump criteria, Take-off systems, dump mills, packaging, single pass system. Mill mixing and Continuous mixing.

Trouble shooting in mixing: Inadequate dispersion or distribution, scorch compound, contamination, poor handling on dump mill and batch to batch variation.

Unit – II

Extrusion: Basic principles of extrusion. Extrude types Ram type and screw types General mechanical construction of a single screw extruder. Screw design, drive mechanism, temperature control, feed arrangement. Description of Die construction. Function and lay out of ancillary equipments. Cold feed extruder, Hot feed extruder, Vented cold feed and Pin extruders.

Trouble shooting – output rate, dimensional stability, excessive heat generation and rough extrudate, rough surface on extrudate, Contamination, porosity in extrudate.

Unit- III

Calendaring: Construction, function and uses of calendaring machinery. Types of calendar rolls, roll positioning and adjustments. Temperature control, bending corrections by different methods. Bearings, drives and lubrication systems. Power requirement. Comparison with extruder, cost – comparison with spreading process.

Calendaring operations: sheeting, fractioning, coating, profiling, embossing etc. Trouble shooting in calendaring: Scorch, blistering, rough or holed sheet, tack, bloom.

Unit – IV

Moulding: Molding of high viscosity materials: Compression, transfer, injection and bladder molding.

Molding of low viscosity material: Casting, reaction injection molding (RIM). Mould design and mould materials. Mould lubrication, mould cleaning, mould shrinkage. Advantages and disadvantages between different molding techniques.

Transfer molding: Equipment used, comparison, costing and safety.

Injection molding: Description, comparison of Ram and Screw Injection system. Typical drive systems and requirement of feed analysis. Molding temperature control, requirement of clamping and loading arrangements. Molding defects, their causes and remedies.

Unit– V

Fabrication Techniques: General description of fabrication techniques currently used in industrial practice.

Vulcanization Techniques: Thermal energy for vulcanization, saturated steam method, heated gas method, heat transfer fluid method, direct energy transfer method. **Vulcanization methods:** batch, semi-continuous and continuous vulcanizations and equipment. Open steam vulcaniser, steam tube (autoclave), function of steam trap, control system for steam pressure and temperature. Various allied instrumental control systems. Pressurized gas or liquid vulcaniser, Hot air vulcanising tunnel, continuous microwave oven, liquid or pseudo-liquid curing.

Recommended Books

Rubber Technology and Manufacturing: C.M.

Blow. Rubber Technology Handbook:

Hoffman.

Introduction of Polymer Sc. & Rubber Technology, Vol. I, Ed By Dr. R.

Mukhopadhyay. Rubber Engineering, Ed. By K.S. Logonathan.

Rubber Technology, Ed. By Maurice Morton.

Rubber Processing: An Introduction, Peter S. Johnson.