(b) Explain the simple elongation flow of a polymeric sample.

(c) Why does cross sectional size of the die orifice of the extruder and the final size of the extruded part differ? (3×5=15)

7. Write short notes on any **five** :

(a) Internal Mixer.

(b) L/D ratio in an extruder

(c) Importance of master batches

(d) Melt flow index

(e) Dynamic mechanical testing

(f) Melt fracture (5×3=15)

[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 4124 **H**

Unique Paper Code : 6092011202

Name of the Paper : Polymer Rheology

Name of the Course : **B.Sc. (H) Polymer Science (UGCF)**

Semester : II

Duration : 3 Hours Maximum Marks : 90

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Scientific calculator is allowed.
3. Attempt **six** questions in all.
4. Question No. **1** is compulsory.
5. Draw neat and labelled diagram wherever required.

1. (a) Illustrate the hysteresis curves for thixotropic and rheopectic fluids.

(b) Determine the shear rate of a fluid rotating at a rotational speed of 1500 min^{-1} in a cone and plate rheometer (radius = 15 mm and cone angle = 1.5°)

(c) Explain turbulent mixing with its significance.

(d) Derive fluid behaviour using Ostwald- de Waele model.

(e) Explain the phenomenon of die swell for the extruded melt.

(f) What is a Rheometer? List the types of Rheometers. (6×2.5=15)

2. (a) Describe the static state relaxation curve for the Maxwell model.

(b) Explain time dependent behaviour of a non-Newtonian fluids in details.

(c) Explain an elastic and viscoelastic properties of polymers. (3×5=15)

3. (a) Discuss the melt compounding in details.

(b) Describe the types of polymers mixing with schematic representation.

(c) Discuss the velocity distribution of polymer melt in single screw extruder. (3×5=15)

4. (a) Drive the relation for static creep compliance for the Maxwell model.

(b) Describe power law model for calculating pseudoplastic behaviour of polymer melt.

(c) Describe the 'cone and plate' viscometer in details. (3×5=15)

5. (a) Describe various factors affecting viscosity of polymer melts.

(b) Explain apparent viscosity and zero shear viscosity.

(c) Explain the Bagley's correction factor. How it can be used to correct the apparent shear stress to give true value of shear stress? (3×5=15)

6. (a) Calculate shear stress, shear rate and viscosity of the polymer from the following data obtained for HDPE using a capillary viscometer (capillary dia: 4 mm).

Length-Diameter ratio	$\Delta P(M/m^2)$	$Q\ (cm^3/sec)$
L/D=4	2×10^6	0.25
	4×10^6	1.00