

GUJARAT TECHNOLOGICAL UNIVERSITY
BACHELOR OF ENGINEERING – SEMESTER 3 – EXAMINATION – SUMMER 2026

Subject Code: 3132306

Date: 03/07/2026

Subject Name: Applied mathematics in Plastic Industry

Time: 02:30 PM TO 05:00 PM

Total Marks: 70

Instructions:

- 1. Attempt all questions.**
- 2. Make suitable assumptions wherever necessary.**
- 3. Figures to the right indicate full marks.**
- 4. Simple and non-programmable scientific calculators are allowed.**

- Q.1** (a) Define the following: i) Rheology ii) Stress iii) Strain **03**
(b) Explain the Hooke's model for elastic behavior with suitable graphs. **04**
(c) Give the classification of Non-Newtonian fluids with suitable examples. **07**
- Q.2** (a) Explain the viscoelastic behavior of plastics. **03**
(b) Describe the Newton's model with suitable graphs. **04**
(c) With a neat schematic diagram, describe the Burger model for polymer viscoelasticity. **07**
- OR**
- Q.2** (c) Explain the analysis & heat transfer during polymer processing & state the equations of Fourier number & temperature gradient. **07**
- Q.3** (a) Define i) Viscosity ii) Aspect Ratio iii) Modulus **03**
(b) Explain the Residence time & Relaxation Time in polymer processing. **04**
(c) With a neat sketch, describe the construction & working of a cone & plate viscometer. Discuss its advantages in determining the viscosity of polymer melts over other viscometers. **07**
- OR**
- Q.3** (a) Discuss the concept of stress concentration. **03**
(b) Define the coefficient of thermal expansion. Give equation to determine coefficient of thermal expansion. **04**
(c) Explain the operating principle of a Ram Extruder. Discuss its key advantages & industrial applications over conventional screw extruders. **07**
- Q.4** (a) Discuss about short and long term testing of plastics. **03**
(b) Explain the process of polymer melt with example. **04**
(c) Explain the Maxwell model for viscoelastic fluids & obtain the mathematical expression for stress relaxation. **07**
- OR**
- Q.4** (a) Discuss about Melt fracture & Shark skin flow defect. **03**
(b) Describe creep curve with various stages in brief. **04**
(c) Discuss Swelling ratios due to shear stresses in long capillary. **07**
- Q.5** (a) Define Polymer Composite. Explain different types of matrix used in polymer composites. **03**
(b) Describe briefly the Pseudo elastic design methods of plastics. **04**

- (c) Explain the Kelvin-Voigt model with mathematical expressions. **07**
- OR
- Q.5** (a) Discuss the function of reinforcement & different types of fiber reinforcements used in polymer composites. **03**
- (b) Explain the three point bending test. **04**
- (c) With a neat sketch explain about concentric cylinder viscometer. **07**
