

GUJARAT TECHNOLOGICAL UNIVERSITY
BACHELOR OF ENGINEERING – SEMESTER 6 – EXAMINATION – SUMMER 2026

Subject Code: 3162308

Date: 01/06/2026

Subject Name: Advanced Plastic Processing Techniques

Time: 10:30 AM TO 01:00 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 water-assisted injection molding, and state its primary purpose. **03**
 - (b)** List the application areas of the following advanced plastic processing techniques: i) Reaction injection molding, and (ii) Radiation processing. **04**
 - (c)** Explain the basic working principle of Reaction Injection Molding. Describe the function of each component used in the RIM process. **07**
- Q.2**
- (a)** Explain the role of blowing agents in foam production, along with appropriate examples. **03**
 - (b)** Differentiate between superimposed, offset and Z calenders. **04**
 - (c)** Summarize the advantages and disadvantages of using RIM in manufacturing. **07**
- OR
- Q.2**
- (c)** Summarize the differences between open-cell and closed-cell vinyl foams. **07**
- Q.3**
- (a)** Define the terms: cored roll, drilled roll and calender faults. **03**
 - (b)** Explain, with the help of a schematic diagram, how ionizing radiation causes crosslinking in thermoplastics. **04**
 - (c)** i) Compare the heating efficiency of different calender heating systems. **07**
ii) Which technique, insert molding or multicolor molding, would be more suitable for producing a multi-functional medical device? Justify your answer.
- OR
- Q.3**
- (a)** Summarize the differences between ultraviolet and microwave radiation processing. **03**
 - (b)** Explain the working principle of gas-assisted injection molding, and how it reduces part weight. **04**
 - (c)** i) Distinguish between types of circulating systems used for roll temperature control in calendering. **07**
ii) Assess the potential environmental benefits of using MuCell over conventional molding methods.
- Q.4**
- (a)** Define casting in the context of plastics manufacturing, and state its applications. **03**
 - (b)** i) Discuss the benefits of embedding metal parts using insert molding. **04**
ii) Design an optimized calendering process for manufacturing decorative vinyl flooring.

- (c) i) Apply the concept of infrared radiation to cure a polymeric coating on a heat-sensitive substrate. **07**
ii) Suggest a suitable radiation technique for producing crosslinked packaging films. Justify your choice.

OR

- Q.4** (a) Summarize how microcellular foam is created in MuCell technology. **03**
(b) i) Describe the layout of a typical calendering unit. **04**
ii) Propose a modified production method to improve sustainability in foam manufacturing.
(c) i) How would you apply encapsulation techniques for protecting sensitive electronic components? **07**
ii) How would you apply insert molding to improve the durability of a household electrical switch?
- Q.5** (a) i) Why might poor bonding occur between the insert and plastic in insert molding? **03**
ii) What are the common reasons for color misalignment in multicolor molding?
(b) Apply the concept of infrared radiation to cure a polymeric coating on a heat-sensitive substrate. **04**
(c) Develop a troubleshooting guide for common calendering faults with suggested remedies. **07**

OR

- Q.5** (a) i) Why might water leakage occur in water-assisted injection molding, and what steps can be taken to prevent it? **03**
ii) What causes surface defects in multicolor molding, and how can they be avoided?
(b) How would you choose a suitable roll type (drilled or cored) for a heat-sensitive polymer? **04**
(c) Why might short shots or incomplete filling occur in gas-assisted or water-assisted injection molding, and how can this issue be resolved through process parameter adjustments? **07**
