

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

Subject Code: 3132604

Date: 19/06/2026

Subject Name: Rubber Physics & its thermodynamics

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 term “Heat of Polymerization (ΔH_P).” Also list the factors affecting it. 03
(b) Apply the first law of thermodynamics to an isothermal expansion of an ideal gas. 04
(c) Discuss the relationship between gibbs free energy, enthalpy, and entropy and explain how it determines the spontaneity of polymerization reactions. 07
- Q.2** (a) What are the phase diagrams in terms of polymer systems? 03
(b) Compare entropy and enthalpy contributions in polymer dissolution. 04
(c) Describe the concept of ceiling temperature and explain how it governs the feasibility of polymerization reactions. 07
- OR
- Q.2** (c) Explain the relationship between molecular weight and thermal conductivity in polymers. 07
- Q.3** (a) Which thermodynamic forces favor crystallinity in polymers? 03
(b) Apply Archimedes’ principle to determine the density of a rubber specimen experimentally. 04
(c) Explain in detail about four elastic constants associated with rubber. 07
- OR
- Q.3** (a) How molecular weight affects thermal conductivity of polymer? 03
(b) Compare static, sliding, and rolling friction for rubber materials. 04
(c) Explain the method used to determine the surface tension of rubber solution. 07
- Q.4** (a) What do you mean by R-class rubber? Also give it’s example with structure. 03
(b) Apply the concept of refractive index to explain how it helps identify rubber and polymer blends. 04
(c) Explain structure property relationship observed in rubber. 07
- OR
- Q.4** (a) What do you mean by M-class rubber? Also give it’s example with structure 03
(b) Compare how transparent and opaque rubbers differ in light transmission and absorption. 04
(c) Explain in detail about characteristic properties of rubber. 07
- Q.5** (a) Define given terms: 03
(i) Monomer(ii)Polymer(iii)Polymerization
(b) Differentiate the low molecular weight compound and polymer. 04
(c) Explain in detail about bulk polymerization technique. 07

OR

Q.5	(a) Define given terms: (i) Initiator(ii)Inhibitor(iii)Chain Transfer Agent	03
	(b) Differentiate the chain growth polymerization and step-growth polymerization .	04
	(c) Explain in detail about suspension polymerization technique.	07
