

Enrollment No./Seat No.:

GUJARAT TECHNOLOGICAL UNIVERSITY
Bachelor of Engineering - SEMESTER - VI EXAMINATION - SUMMER 2025

Subject Code: 3162608

Date: 28-05-2025

Subject Name: Reverse Engineering and Analysis of Rubber Products

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.**

	Marks
Q.1 (a) What is practical significance of solvent extraction analysis of rubber? How it's result is expressed?	03
(b) Identify difference between ash content determination and chemical digestion.	04
(c) Develop the flow diagram indicating the various steps associated with concept of reverse engineering of rubber and rubber related materials.	07
Q.2 (a) What do you mean by Specimen Interaction Volume? How is it determined?	03
(b) Compare Small Angle X-ray Scattering Technique (SAXS) with Wide Angle X-ray Scattering Technique (WAXS).	04
(c) With labeled diagram, explain major components of Scanning Electron Microscopy (SEM).	07
OR	
(c) With labeled diagram, explain major components of Transmission Electron Microscopy (TEM).	07
Q.3 (a) Show the ideal Dynamic Mechanical Analysis (DMA) thermogram of amorphous material.	03
(b) List out the possible sources of error during differential Scanning Calorimetry (DSC) analysis.	04
(c) Explain in detail about the thermo balance with it's key features.	07
OR	
(a) Name different probe assembly used in case of Thermo Mechanical Analysis (TMA).	03
(b) Classify Differential Scanning Calorimetry Apparatus (DSC). Write on any one.	04
(c) Thermo gravimetric Analysis (TGA) is suitable technique to determine the filler content present in rubber vulcanizate- Justify this statement with suitable example.	07
Q.4 (a) Which characteristic information related to rubber and rubbery material is obtained from Gas Chromatography (GC)?	03
(b) Distinguish the adsorption chromatography and partition chromatography with suitable examples.	04

- (c) Explain in detail about the major components of High performance Liquid Chromatography (HPLC) apparatus. 07

OR

- (a) Define the given terms: (i) Retention Time(ii)Retention Volume (iii) Resolution 03
- (b) List major types of column used in Gas Chromatography. Write on any one. 04
- (c) With schematic diagram, explain the mechanism and working of Size Exclusion Chromatography. 07

- Q.5** (a) What do you mean by interferometer? 03
- (b) Compare absorption spectra with emission spectra. 04
- (c) Explain in detail about various sample preparation methods followed to carry out spectroscopic analysis of rubber and rubber related materials. 07

OR

- (a) What do you mean by monochromator? 03
- (b) Compare single beam spectrophotometer with double beam spectrophotometer. 04
- (c) Explain method to express the result of Nuclear Magnetic Resonance Spectroscopy for rubber and rubber related material. 07
