

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-VI (NEW) EXAMINATION – SUMMER 2023

Subject Code:3162608

Date:12-07-2023

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.
4. Simple and non-programmable scientific calculators are allowed.

- Q.1**
- (a) Outline the concept of ‘Reverse Engineering’ with respect to rubber and rubber related materials. **03**
 - (b) Give name of chemical method used to separate the highly volatile organic materials present in rubber. Also write about it. **04**
 - (c) Illustrate and explain the technique which is used to separate the rubbers from the fillers and it’s quantitative analysis. **07**

- Q.2**
- (a) What do you mean by specimen interaction volume? On which factors it depends? **03**
 - (b) Brief out the given terms: (1)Small Angle X-ray Scattering(2) Wide Angle X-ray Scattering **04**
 - (c) Explain the given terms with respect to Electron Microscopy:(1) Secondary Electrons(2)Backscattered Electrons **07**

OR

- Q.2**
- (c) Explain in detail about the application of Electron Microscopy with respect to rubber and rubber related materials. **07**

- Q.3**
- (a) Write on different types of crucibles are used in Thermogravimetric Analysis (TGA) with their diagrams. **03**
 - (b) Differentiate the Heat Flux Differential Scanning Calorimetry (DSC) and Power Compensated Differential Scanning Calorimetry (DSC). **04**
 - (c) Give types of Dynamic Mechanical Analyzer based on it’s working principle. Explain any one in detail. **07**

OR

- Q.3**
- (a) Which different methods are available to express the result of Thermogravimetric Analysis (TGA)? Which one is preferable? Why? **03**
 - (b) Outline different types of probe geometry used in Thermo mechanical Analysis (TMA) of rubber and rubber related materials. **04**
 - (c) Discuss a can of Dynamic Mechanical Analysis (DMA) showing the types of transitions seen during the analysis by taking suitable example of rubber. **07**

- Q.4**
- (a) Classify chromatographic methods based on the physical configuration of the stationery phase. **03**
 - (b) Explain the working principle of Gel permeation Chromatography (GPC). **04**

- (c) Explain in detail about the High Performance Liquid Chromatography (HPLC). **07**
- OR**
- Q.4** (a) Classify chromatographic methods based on separation mechanism. **03**
- (b) List the different parameters affecting the performance of Gas Chromatography. Write on any two. **04**
- (c) Explain the Gas Chromatography with its application in characterization of rubber and rubbery materials. **07**
- Q.5** (a) Define the term ‘Dispersing Device’ with respect to spectroscopy. Also give its function. **03**
- (b) List out different detectors used in Infrared Spectroscopy. Write on any one. **04**
- (c) Discuss in detail about Beer-Lambert’s law. Also give its application. **07**
- OR**
- Q.5** (a) Write a brief note on ‘monochromator’. **03**
- (b) Identify advantages of Fourier Transform Infrared Spectroscopy (FTIR) over Infrared Spectroscopy (IR). **04**
- (c) Describe the different sample preparation methods used in Infrared Spectroscopy (IR). Which one is preferred? Why? **07**
