

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VI (NEW) EXAMINATION – WINTER 2023****Subject Code:3162608****Date:11-12-2023****Subject Name:Reverse Engineering and Analysis of Rubber Products****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)** Out the term 'Reverse Engineering'. Also give it's practical significance with respect to rubber and rubber related materials. **03**
- Q.1 (b)** With schematic diagram brief out the given terms :(i) Exothermic peak(ii)Endothermic Peak with respect to thermal analysis of rubber. **04**
- Q.1 (c)** Illustrate the various chemical techniques used in reverse engineering of rubber. Explain any one in detail. **07**
- Q.2 (a)** Which characteristic information related to rubber and rubbery materials is obtained from Scanning Electron Microscopy (SEM)? **03**
- Q.2 (b)** Compare Small Angle X-ray Diffraction Technique (SAXS) with Wide Angle X-ray Diffraction Technique (WAXS). **04**
- Q.2 (c)** With labeled diagram, explain the given terms: (i) Secondary Electrons (ii) Back Scattered Electrons **07**
- OR
- Q.2 (c)** Explain in detail about the applications of Electron Microscopy with respect to rubber and rubber related materials. **07**
- Q.3 (a)** How Highly Volatile Matter differs from Medium Volatile Matter? **03**
- Q.3 (b)** List the methods used to express the result of Thermogravimetric Analysis (TGA) Write on any one. **04**
- Q.3 (c)** Differential Scanning Calorimetry is suitable technique to find out the glass transition temperature and degree of crystallinity respectively of rubbery material-Justify this statement with suitable examples. **07**
- OR
- Q.3 (a)** Which different types of crucibles are used in case of Thermogravimetric Analysis (TGA)? **03**
- Q.3 (b)** Classify the types of Dynamic Mechanical Analysis (DMA) measurement. Write on any one. **04**
- Q.3 (c)** Differential Thermal Analysis (DTA) is suitable technique to find out the post curing temperature of rubbery material- Justify this statement with suitable example. **07**
- Q.4 (a)** What do you mean by bulk property detector? Also give it's examples **03**
- Q.4 (b)** Distinguish the column chromatography and planer chromatography with suitable examples. **04**
- Q.4 (c)** Explain in detail about the Thin Layer Chromatography (TLC). **07**
- OR
- Q.4 (a)** What do you mean by solute property detector? Also give it's examples. **03**
- Q.4 (b)** List major components of Gas Chromatography assembly. Write on any two. **04**
- Q.4 (c)** Gel Permeation Chromatography is the best technique to determine the polymer molecular weight-Justify this statement with suitable example. **07**

- Q.5 (a)** What do you mean by absorption spectra? **03**
- Q.5 (b)** Compare Infrared Spectroscopy(IR) with Fourier Transform Infrared Spectroscopy(FTIR) **04**
- Q.5 (c)** Describe the 'Beer-Lambert's Law. **07**
- OR
- Q.5 (a)** What do you mean by emission spectra? **03**
- Q.5 (b)** Classify the spectrometer according to it's basic configuration. Write on any one. **04**
- Q.5 (c)** Explain in detail about principle and mechanism of Ultraviolet (UV) spectroscopy. **07**
