

GUJARAT TECHNOLOGICAL UNIVERSITY**BE- SEMESTER-VI (NEW) EXAMINATION – WINTER 2024****Subject Code:3162608****Date:02-12-2024****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) What do you mean formula reconstruction with respect to rubber? How is it carried out? **03**
 (b) Develop process flowchart showing various stages associated with reverse engineering of rubber. **04**
 (c) Name a method used to separate the highly volatile organic material present in rubber. Also explain in detail. **07**

- Q.2** (a) What do you mean by secondary electrons? **03**
 (b) Identify main difficulties in exploitation of Transmission Electron Microscopy (TEM). **04**
 (c) Explain the applications of various microscopic techniques in characterization of rubber and rubber related materials. **07**

OR

- (c) Explain the major components of Scanning Electron Microscopy (SEM) assembly with it's function. **07**

- Q.3** (a) Define the given terms: (i) Base Line (ii) Exothermic Peak (iii) Endothermic Peak **03**
 (b) Classify types of Differential Scanning Calorimetry (DSC) Assembly. Write on any one. **04**
 (c) Explain in detail about various probe geometries used in Thermo mechanical Analyzer (TMA). **07**

OR

- Q.3** (a) Which different types of crucibles are used in Thermogravimetric Analysis (TGA)? **03**
 (b) Construct labeled Differential Scanning Calorimetry(DSC) thermogram with different transitions for an ideal rubbery material. **04**
 (c) Explain in detail about Dynamic Mechanical Analysis (DMA), showing the types of transitions observed during the analysis by following suitable example of rubber. **07**

- Q.4** (a) What do you mean by R_f value? Which parameters affect R_f value? **03**
 (b) List out types of detectors used in Gas Chromatography (GC) Write on any two. **04**
 (c) Explain the possible sources of error in case of Thin Layer Chromatography (TLC). **07**

OR

- Q.4** (a) Which different types of columns are used in Gas Chromatography (GC)? **03**
 (b) Differentiate Gas Solid Chromatography (GSC) and Gas Liquid Chromatography (GLC). **04**
 (c) Explain the major components of High Performance Liquid Chromatography (HPLC) apparatus. **07**

- Q.5** (a) What do you mean by beam splitter? **03**
 (b) Compare absorption spectra with emission spectra. **04**
 (c) Explain different types of bending and stretching vibrations observed in rubber molecule during Infrared spectroscopy. **07**

OR

- Q.5** (a) Show function of given components with respect to spectrophotometer : (i) Prism (ii) Entrance Slit (iii) Exit Slit **03**
 (b) Differentiate single beam spectrophotometer and double beam spectrophotometer. **04**
 (c) Explain in detail about Nuclear Magnetic Resonance Spectroscopy (NMR). **07**
