

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

Subject Code: 3142601

Date: 08-05-2025

Subject Name: Rubber Compounding Materials

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.**

- Q.1**
- (a) Summarize the role of fatty acids in organic synthesis **03**
 - (b) Differentiate between linear and branched isomers of alkanes. **04**
 - (c) Justify the advantages and disadvantages of using resorcinol and phenol in high-performance rubber applications and draw its structure. **07**
- Q.2**
- (a) Discuss the physical & chemical properties of precipitate Silica. **03**
 - (b) Compare the role of aluminum compounds and magnesium compounds as fillers in rubber formulation. **04**
 - (c) Apply your knowledge to predict which sulphur allotropes widely used in rubber industry and justify with proper example. **07**
- OR**
- (c) Demonstrate the manufacturing process of silica and explain how it is used to improve rubber performance. **07**
- Q.3**
- (a) Define the term "synergism" in the context of rubber compounding. **03**
 - (b) Explain the classification of rubber additives based on their functions. **04**
 - (c) Investigate the different types of bloom occurs in rubber compound in detail and write the reason of bloom in each. **07**
- OR**
- (a) Define the given terms: (i) Peptizer (ii) Retarder (iii) Compounding **03**
 - (b) Interpret the concept of recurring theories in rubber additive interactions. **04**
 - (c) Analyze the possible causes of impurity in a zinc oxide production plant and identify process steps that may contribute to quality loss. **07**
- Q.4**
- (a) Apply your knowledge to select suitable compounding aids for a rubber product that requires high flexibility and low temperature resistance. **03**
 - (b) Distinguish between factices and plasticizers in terms of their effects on rubber properties. **04**
 - (c) Show the chemical reaction of autoxidation of hydrocarbon polymers and write the approaches to minimize damage due to oxidation. **07**
- OR**
- (a) Suggest the name of peptizer used for natural rubber and chloroprene rubber with its minimum operative temperature and dosage. **03**
 - (b) Describe the mechanism of action of blowing agents in foam rubber. **04**
 - (c) Show the chemical reaction of chain breaking antioxidants of polymer and discuss the amine antioxidants in detail. **07**

- Q.5 (a)** Interpret the classification system of carbon black grades as per ASTM N-series. **03**
- (b)** Compare the effects of different carbon black structures on the hardness and tensile strength of rubber. **04**
- (c)** Your company receives an order of 8 Lakh piece of hollow rubber O-ring to be supplied annually to a Car manufacturing company. The weight of a Rubber O-ring is 30 gram. Calculate (i) Specific gravity of compound (ii) Cost of one O-Ring.(iii) Design number of cavities (iv) Convert PHR to Kg and Prepare the 40kg Batch **07**

OR

- (a)** write the important properties of carbon black. **03**
- (b)** Distinguish between channel black and furnace black in terms of production, properties, and application. **04**
- (c)** Develop the formulation for Red color Rubber ball which have rebound resilience (70%), low specific gravity, low compound cost and ash content should not be higher than 20%. **07**
