

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE- SEMESTER-IV (NEW) EXAMINATION – WINTER 2024****Subject Code:3142601****Date:19-11-2024****Subject Name: Rubber Compounding Materials****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) Give the general chemical structure of phenols and write its application. **03**  
 (b) Compare and contrast the reactivity of alkenes with alkynes in terms of addition reactions. **04**  
 (c) Discuss in detail about Fatty Acids used in rubber industry. **07**
- Q.2** (a) List out the different processing oil used in rubber industry and differentiate it. **03**  
 (b) How do inorganic compounds like zinc oxide and magnesium oxide influence the curing process of rubber? **04**  
 (c) Discuss in detail about the different allotropes of sulfur. **07**
- OR**
- (c) Explain in detail about the manufacturing process of Zinc oxide. **07**
- Q.3** (a) Mentions the important application of Silica. **03**  
 (b) Differentiate between stabilizers and plasticizers, explaining their roles in polymer formulations. **04**  
 (c) Explain the chain Breaking reaction of antioxidants. **07**
- OR**
- Q.3** (a) Describe a real-world example related to rubber where two substances exhibit synergistic behavior to enhance their combined effect. **03**  
 (b) Name two amine antioxidant and two phenolic antioxidants commonly used in rubber formulations. **04**  
 (c) Discuss the amine antioxidants in detail. **07**
- Q.4** (a) “Wax is preferable or not” justify the statement **03**  
 (b) Give the difference between process aids and factices in rubber compounding. **04**  
 (c) Your company has received an order for a 5 Lakh piece of rubber track pad to be supplied annually to a paver machine company. The weight of a rubber track pad is 2.500 kg. Calculate (i) Specific gravity of compound (ii) Cost of one rubber track pad. **07**
- OR**
- Q.4** (a) Differentiate between hydrated and pyrogenic Silica. **03**  
 (b) How do accelerators influence the rate of vulcanization in rubber, and why are they essential in the production of rubber products? **04**  
 (c) Discuss in detail about the Peptisers used in the rubber industry. **07**
- Q.5** (a) Differentiate between organic blowing agent and inorganic blowing agent. **03**  
 (b) How would you use a blowing agent to create lightweight foam material, and what factors would you consider ensuring the foam has the desired density and properties? **04**  
 (c) Analyze the impact of carbon black classification on the final properties of rubber, considering factors like surface area, particle size, and structure. **07**

**OR**

- Q.5** (a) Explain how plasticizers improve the flexibility and processability of polymers. **03**
- (b) If you were tasked with formulating a new rubber product for automotive tires, how would you select and incorporate accelerators into the rubber compound? **04**
- (c) Explain the “Thermal black process “with flow diagram in detail. **07**

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