



NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF ENGINEERING

DEPARTMENT OF FIBRE AND POLYMER MATERIALS ENGINEERING

RUBBER TECHNOLOGY I

TFE 3202

Second Semester Examination Paper

March 2025

This examination paper consists of 2 pages

Time Allowed: 3 hours

Total Marks: 100

Special Requirements: NIL

Examiner's Name: Mr. S. NCUBE

INSTRUCTIONS

1. Answer **question 1** and **any three** questions. Each question carries **25 marks**. This paper contains **five** questions.
2. The first fifteen minutes should be spent reading the question paper and making notes.
3. **Do not** open your answer sheet until told to do so.
4. Marks will be awarded for skill in appreciating the scope of questions, clarity of argument and conciseness of presentation as well as for the knowledge displayed by a candidate.

MARK ALLOCATION

QUESTION	MARKS
1.	25
2.	25
3.	25
4.	25
5.	25

QUESTION 1

- a. Define the following
- i. Sprue [2 Marks]
 - ii. Moulding [2 Marks]
 - iii. Viscoelasticity [2 Marks]
 - iv. Die swell [2 Marks]
 - v. Migration [2 Marks]
- b. In the design of rubber products, explain the factors affecting the viscoelasticity of rubber [15 Marks]

QUESTION 2

- a. Briefly discuss the significance of rheology in rubber manufacture [5 Marks]
- b. Draw a diagram of a Banbury mixer [10 Marks]
- c. Discuss the processes that can be carried out on a two roll mill machine [10 Marks]

QUESTION 3

Calculate the amount of rubber required produce the following goods. Density of the rubber compound is 1.54g/ccm.

- i. Lining of a Frustrum with $h=10m$, $R1=30m$ and $R2=13m$ [5 Marks]
- ii. 6000 screen balls of radius 50mm [5 Marks]
- iii. Mining hose with an outside diameter of 150mm and is 30 mm thick [5 Marks]
- iv. Ball mill drum with height 5m and radius of 1m. Assume top is closed [5 Marks]
- v. Truck bucket with a length of 5m, width of 2.5m and height of 50cm [5 Marks]

QUESTION 4

- a. Briefly explain the factors that affect the rheology of rubber during manufacture [10 Marks]
- b. Testing of rubber rheology can be carried out using different methods. Describe the appropriate test method to be used to evaluate the following:
- a. Extrudability of rubber [5 Marks]
 - b. Elasticity [5 Marks]
 - c. Batch Consistency [5 Marks]

QUESTION 5

With environmental concerns growing in the past few decades, manufacturing plants have been facing pressure to make their manufacturing processes more environmentally friendly. Discuss the methods you would use as a production manager to make your production processes more environmentally friendly. [25 Marks]