



**NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY**  
**FACULTY OF ENGINEERING**  
**DEPARTMENT OF FIBRE & POLYMER MATERIALS ENGINEERING**  
**COURSE: COLOURATION OF MATERIALS**  
**TFE 3104**

**First Semester Examination Paper**

**December 2024**

This examination paper consists of **2** pages

**Time Allowed:** 3 hours  
**Total Marks:** 100  
**Special Requirements:** N/A  
**Examiner's Name:** Mrs N R Ndebele

**INSTRUCTIONS**

1. Answer **QUESTION ONE** and **ANY THREE** 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 the candidate.

**MARK ALLOCATION**

<b>QUESTION</b>	<b>MARKS</b>
1	25
2	25
3	25
4	25
5	25

### **QUESTION 1**

- a. Define the following terms:
- (i) Chromophore
  - (ii) Auxochrome
  - (iii) Metamerism
  - (iv) Fluorescence
  - (v) Iso-electric point
- [10 Marks]
- b. Describe the major characteristics of all colourants. [5 Marks]
- c. Using chemical equations illustrate how azo dyes are synthesised and draw the structure of any one dye intermediate formed. [10 Marks]

### **QUESTION 2**

- a. State the three components of a 'triad'. [3 Marks]
- b. Briefly explain the three forms of metamerism. [6 Marks]
- c. Differentiate between additive and subtractive colour mixing. [6 Marks]
- d. Using any polymeric material of your choice, propose how you would impart a specific colour to it, clearly outlining all the steps that you will carry out. [10 Marks]

### **QUESTION 3**

- a. State any five dye classes that can be used to colour textiles. [5 Marks]
- b. Write short notes on the chemistry of inorganic pigments. [10 Marks]
- c. Explain the mechanism of leather dyeing taking into consideration the iso-electric point of collagen. [10 Marks]

### **QUESTION 4**

- a. Discuss any three methods used for the colouration of plastics. [15 Marks]
- b. Discuss the effects of colorants on properties of various polymeric materials, taking into consideration aspects such as mechanical properties, heat resistance, friction & wear; and weather resistance. [10 Marks]

### **QUESTION 5**

- a. State any 5 types of chromic materials. [5 Marks]
- b. Discuss the principles and applications of special effect colourants. [20 Marks]

**END OF EXAMINATION QUESTION PAPER**

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