

**NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY**

**DEPARTMENT OF TEXTILE TECHNOLOGY**

**END OF SECOND SEMESTER EXAMINATIONS - AUGUST 2009**

**TXT 4227 - COLOUR SCIENCE**

**TIME: 3 HOURS**

**INSTRUCTIONS**

Answer **Question 1** and **ANY FOUR** other questions. Each question carries **20 marks**.

**QUESTION 1**

(a) Explain or define the following:

- (i) standard observer
- (ii) geometric metamorphism
- (iii) colour constancy
- (iv) monochromatic light
- (v) Hue
- (vi) Tristimulus value

**(6)**

(b) State Beer-Lambert's Law and calculate the molar extinction coefficient of a dye whose solution has a concentration of  $10^{-5}$ M and gives an absorbance of 1.8 at  $\lambda_{\max}$  in a cell of pathlength 2cm. Explain what you understand by absorbance and co-efficient of extinction.

**(10)**

(c) Explain what you understand by scotopic and photopic vision.

**(4)**

**QUESTION 2**

With the aid of a suitably labelled diagram(s) explain the principal features of a human eye. Indicate if any, of the following statements is/are correct:

- (i) The fovea contains cone light-sensing elements only.
- (ii) 8% of the population have some form of colour vision defect.

- (iii) Tests have shown that people with normal vision can distinguish up to 5 million different colours.
- (iv) More men than women are prone to have hereditary defective colour vision. (20)

**QUESTION 3**

- (a) Give the Kubelka-Munk equation relating to the percentage of light reflected to dye concentration, and state the assumptions made (DO NOT GIVE DERIVATION). (5)
  
- (b) Write notes on subtractive and additive colour mixing. (15)

**QUESTION 4**

Describe one method of colour reproduction based on additive and one based on subtractive colour mixing. State the hue that you would expect to observe for both the additive and the subtractive mixing of each of the following colour pairs.

- Red and green
- Green and magenta
- Yellow and blue (20)

**QUESTION 5**

With the aid of a clearly labelled diagram, describe the essential features of a reflectance spectrophotometer suitable for colour measurement. Discuss problems involved in measuring fluorescent samples and some steps that can be taken to minimise them. (20)

**QUESTION 6**

Give an account of the importance of CIE (1931) system of colour specification. Explain some of its shortcomings and how these have been dealt with in the various developments that followed. (20)

**END OF QUESTION PAPER**

