NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

DEPARTMENT OF TEXTILE TECHNOLOGY
END OF SEMESTER EXAMINATIONS JUNE 2004
COLOUR SCIENCE TXT 4227
TIME: 3 HOURS

INSTRUCTIONS

Answer **ALL** questions from Section A and **ANY 3** from section B. Section A carries 40 marks and each question in section B carries 20 marks. Allocate 60 minutes to section A and 120 minutes to section B.

SECTION A

Answer **ALL** questions in this section.

1. Define or explain the following:
   - colour constancy
   - tristimulus values
   - luminance
   - reflectance
   - 20 (superscript please) observer
   - 10o" observer (12 marks)

2. (a) Differentiate between observer metamerism and geometric metamerism. (3 marks)

   (b) Write short notes on subtractive and additive colour mixing. (5 marks)

3. (a) What are principles of optical whitening? (2 marks)

   (b) State the differences between fluorescence and phosphorescence. (4 marks)

   (c) State Beer's Law (2 marks)

   (d) Sate Bee-Lambert Law (2 marks)

   (e) Applying Beer-Lambet's Law calculate the molar coefficient of extinction of a dye whose solution at a concentration of $10^{(-5)}$. M gives an absorbance of 1.8 at lamda max in a cell of pathlength 2cm. (10 marks)

SECTION B

Answer any 3 questions

1. (a) Draw a diagram showing the principal features of the human eye and describe the function of major features in the visual process.

   (b) Explain what is meant by scoptic and photopic vision (20 marks)

2. (a) Sketch the arrangement of the optical components of a reflectance spectrophotometer that is suitable for colour measurement. Explain the principle of the spectrophotometric colour measurement.

   (b) Explain how the results for fluorescent samples would be affected by different light sources. (20 marks)

3. (a) Give the Kubelka-Munk equation relating the percentage of light reflected to dye concentration and state the assumptions made in derivation of equation. (DO NOT DERIVE THE EQUATION)

   (b) Write short notes on "primary colours". (20 marks)

4. Give an account of the CIE system of colour specification, distinguishing carefully between XYZ, xyz, xyz, (x)(y)(z). Explain why illuminant D65 is generally preferred to illuminant C. (20 marks)

5. Give an account of the development of colour difference formulae since 1976. Describe how you would establish a suitable tolerance limit for a particular application. (20 marks)

6. Discuss the relationships between the absorption of light by chemical compounds and their chemical constitution, giving examples wherever possible. Describe how the wavelengths absorbed determine the colour of the compound.

END OF QUESTION PAPER