

The Open University of Sri Lanka
Faculty of Engineering Technology
Department of Textile and Apparel Technology



Study Programme	: Bachelor of Science Honours in Engineering/ Bachelor of Technology Honours in Engineering/ Bachelor of Industrial Studies Honours (Textile Manufacture)
Name of the Examination	: Final Examination
Course Code and Title	: TAX3458 Fibre Science and Technology
Academic Year	: 2022/23
Date	: 19 th February 2024

General Instructions

1. Read all instructions carefully before answering the questions.
2. This is a Closed Book Test (CBT).
3. Write down your Index Number in all the pages of answer scripts.
4. This question paper consists of Six (06) questions in four (04) pages.
5. Answer Five (05) questions only. Each question carries 20 marks
6. Do not write answers to the additional questions.
7. Answers for each question should commence from a new page. If a question has many parts, all the parts should be answered in the chronological order under the same question.
8. Write down the answered question numbers in the cover page of the answer book.
9. Answers should be in clear handwriting.
10. Do not use red colour pens to write the answers.

(Q1) (a) (i) What do you understand by "Staple fibres" & "Filaments" and with giving suitable examples, briefly explain the statement "Natural fibres have staple type as well as filament type fibres". (06 marks)

(ii) "Vegetable fibers can be obtained from the different parts of the plants". Briefly explain this statement and give a suitable example for each case. (03 marks)

(b)(i) Draw a block diagram to illustrate the important manufacturing stages of regenerated fibre production. (04 marks)

(ii) Depending on the raw materials used, different types of regenerated fibres are produced in the industry. With giving suitable examples, explain above statement. (03 marks)

(c) Under the textile fibre classification, different synthetic fibre types are available. State the fibre type for **each** of the following synthetic fibres. (04 marks)

- (I) Aramid fibres (II) Polypropylene (III) Acrylic
(IV) PVA (Polyvinyl alcohol) fibres

(Q2) (a) (i) Briefly explain the terms "Polymerisation" and "Degree of Polymerisation (DP)". (04 marks)

(ii) Differentiate the main two (02) methods of Polymerisation. (04 marks)

(b) (i) Fibre forming polymers can be classified **according to their structure**. Drawing suitable diagrams and briefly explain these four (04) types. (04 marks)

(ii) Draw suitable diagrams to show the differences between Random co-polymers and Block co-polymers. (02 marks)

(c) Based on the **side functional groups** available, polymers can be divided into three main types. Draw and explain these three (03) types. (06 marks)

(Q3) (a) (i) Define "Degree of crystallisation (DC)" of a fibre forming polymer? (02 marks)

(ii) Using a suitable diagram, briefly explain the features of crystalline and amorphous regions available in a textile fibre. (06 marks)

- (b) (i) Using suitable examples, prove that the degree of crystallization is different from fibre to fibre. (02 marks)
- (ii) With giving reasons, briefly explain how does the degree of crystallization effect the breaking strength, and breaking elongation of textile fibres. (04 marks)
- (c) Briefly explain why are the Glass transition temperature (T_g), Melting temperature (T_m) and moisture absorption of textile fibres important for the **manufacturing industry**. (06 marks)
- (Q4) (a) (i) Draw suitable diagrams and give the features of microscopic view of a cotton fibre. (04 marks)
- (ii) Briefly explain how do you measure Staple length of a cotton fibre sample in a laboratory. (02 marks)
- (b) (i) With giving reasons, briefly explain the strength at dry & wet state, hygroscopic nature and effect of acids on cotton fibres. (08 marks)
- (ii) Briefly explain any two (02) reasons why wool are heavily used in making warm clothes for cold seasons. (04 marks)
- (c) Draw suitable diagrams to show features of microscopic views of a silk fibre. (02 marks)
- (Q5) (a) (i) Draw suitable diagrams to show the microscopic views of viscose fibres and give their features. (04 marks)
- (ii) With giving reasons, briefly explain the strength at dry and wet states, hygroscopic nature and after washing shrinkages of viscose materials (06 marks)
- (b) Briefly explain why fabrics and garments made from modal have higher durability than viscose (04 marks)
- (c) Briefly explain the moisture absorbency, dye ability and comfortability of fabrics and garments made from Bamboo fibres. (06 marks)

- (Q6) (a) Draw suitable diagrams to show the microscopic views of nylon and polyester fibres and give their features. (08 marks)
- (b) With giving reasons, briefly explain the strength at dry and wet states , and effect of acids of polyester fibres. (06 marks)
- (c) (i) State any four (04) reasons to heavily use the polypropylene materials for food packing materials. (04 marks)
- (ii) Briefly explain why textured acrylics are used for making warm clothes than flat filaments of acrylics. (02 marks)