Module Title: Leather Technology 3
Level: Six
Time Allowed: Three hours

Instructions to students:

- Enter your student number not your name on all answer books.
- Answer five questions: one question from Section A and four questions from Section B.
- If answering question 7, please answer using the template given in the exam paper.
- All questions are equally weighted. Where a question has more than one part the division of marks is stated.
- Neither books nor notes may be taken into the examination.
- The use of a non-programmable calculator is permitted.
- Insert your student number in the space below:

**Student Number: ..........................................................**

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Section A

Answer one out of two questions.

Question 1

Many tanneries have to meet stringent consent limits for water usage and effluent discharge – identify four areas only from:

- pH,
- Salinity,
- TDS (total dissolved solids),
- SS (suspended solids),
- BOD (biological oxidation demand),
- COD (chemical oxidation demand),
- Nitrogen (nitrites and nitrates),
- Ammonium salts,
- Sulfur (sulfites and sulfates),
- Chromium and other heavy metals.

Discuss each of the four with regard to processing techniques and any effluent treatments that may be employed to meet them. (20 marks)

Question 2

There is much research to reduce the environmental impact of making, using and disposing of leather and effluents.

Detail four research activities that are currently being/have been investigated in the last five years to assist in solving these concerns in the fields of preservation, processing chemicals and operations (parameters), chemical selections etc. (20 marks)
Section B

Answer four out of five questions.

Question 3

The conversion of raw skin into leather involves many processes, each of them having particular functions. Answer the questions below with reference, if required, to production of footwear upper leather.

Preservation


Tanning

b. Chromium tanning gives a permanent preservation.

Give a simple pickling and tanning formulation to produce a 2.25% chromium oxide leather with a calculation for the amount of chromium salt addition. (8 marks)

c. How may the process efficiency of your tanning formulation be improved? (2 marks)

Yield

d. In the last ten-fifteen years the useable area of leather has increased, at the same time improving the perception of leather quality.

Which post tanning mechanical operations have given this and how do they effect these changes? (6 marks)

Total: 20 marks

Question 4

a. Detail and briefly explain five different properties/characteristics between leathers that are vegetable or chromium tanned. (5 marks)

b. Discuss the differences in processing to produce heavy and light leathers (with vegetable tannage) and likely end uses of leathers produced. Consider equipment, raw materials, chemicals and any other relevant process parameters. (7 marks)

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Question 4 continues overleaf
c. Discuss **two** of the following vegetable tanning extracts of Oak Bark, Chestnut, Mimosa, Quebracho or Tara with reference to vegetable source, aesthetics and properties when used in tanning or retanning.

(8 marks)

Total: 20 marks

**Question 5**

a. What are required characteristics and properties for high quality garment leathers?

(5 marks)

b. Discuss the main differences in processing methods needed to make garment leather from both cow hide and wool sheepskin to give these properties. Likely to include some beam house, tanning and wet post tanning operations.

(12 marks)

c. How may aldehydes be used in garment leather processing and which properties will they improve?

(3 marks)

Total: 20 marks

**Question 6**

Modern footwear leathers require some Performance, but they also have aesthetic needs.

a. Detail **five** technical specifications for a man’s full grain performance (WR) footwear upper leather – including values

(10 marks)

b. Write a retanning process from wet blue bovine sides to obtain these specifications. Discuss **five** key operational factors in your answer, together with an appreciation of the chemicals and operations involved.

(10 marks)

Total: 20 marks

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Section B continues overleaf

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Question 7

Answer part b of this question on the template given overleaf.

a. In a typical quality specification for leather there are three main sections:
   i. Leather benchmarking/fingerprinting
   ii. Performance Tests
   iii. Restricted substances

   Explain the relevance of each section.  
   (3 marks)

b. Using the template overleaf compile a simple specification that could be used commercially between your tannery (that produces domestic upholstery leather) and a leather buyer from a leading manufacturer. You should choose the most important tests for each section.

   (15 marks)

c. List two restricted substances and their associated hazards.

   (2 marks)

Total:  20 marks

Template for Question 7. b follows overleaf
Template for question 7. b.

| Domestic Upholstery Leather - pigmented |
| Leather Benchmarking / Fingerprinting: |
| Test Title | Suggested requirements |
| 1. | |
| 2. | |
| 3. | |
| 4. | |
| 5. | |

Performance Tests:

| Test Title |
| 1. |
| 2. |
| 3. |
| 4. |
| 5. |

Restricted Substances:

| Test Title |
| 1. |
| 2. |
| 3. |
| 4. |
| 5. |

End of Section B
End of Paper