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

Study Programme	: Bachelor of Technology Honours in Engineering Bachelor of Industrial Studies Honours
Name of the Examination	: Final Examination
Course Code and Title	**: TAX5349 Nonwoven Textiles**
Academic Year	: 2021/22
Date	: 01st February 2023
Time	: 1330-1630hrs

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) Briefly explain differences of nonwoven fabrics compared to woven and knitted fabrics with refence to the construction, cohesion of constructing components and the strength of fabrics. (06 marks)

(b) Briefly explain any three (03) reasons why nonwovens are being popular in various application fields since past years and give one (01) example for each case. (06 marks)

(c) Briefly explain three (03) reasons why nonwovens are heavily used in apparel manufacturing. (06 marks)

(d) State any two (02) special applications of nonwovens in vehicle or air craft manufacturing other than auto mobile manufacturing. (02 marks)

(Q2) (a) Briefly explain the properties and suitable fibers for nonwoven materials, which can be used in,

(i) Electrical insulation (ii) Thermal insulation (iii) Sound insulation (06 marks)

(b) Using suitable diagrams, briefly explain the working principles of geo-synthetic nonwovens used for following filtration purposes.

(i) Dry filtration (ii) Liquid filtration (04 marks)

(c) Briefly describe the following main functions of geo synthetic nonwovens in civil engineering applications. (06 marks)

(i) Reinforcement (ii) Sealing (iii) Protection and drainage

(d) Briefly explain how nonwovens are used in upholstery products with a spring core and tufted carpets, in the field of home textiles. (04 marks)

(Q3) (a) With referring the operations, compare the two types of dry laid mechanisms used in the nonwoven industry to produce a nonwoven web. (04 marks)

(b) Draw a suitable diagram and explain the mechanism of wet laid nonwoven web formation technique and give any two (02) problems/disadvantages given in the wet laid web formation. (06 marks)

(c) Carded webs are laid in mainly three ways to reach the desired weight in manufacturing nonwovens. Briefly explain these three (03) ways and give the advantage/s of each method. (06 marks)

(d) With reference to the working principles, distinguish two types of spun lay (extruded) web formation in nonwoven manufacturing. (04 marks)

(Q4) (a) (i) With refence to the mechanical web consolidation/web bonding techniques, how the " Needle punching" method is different from other techniques? (04 marks)

(ii) Using a suitable diagram, briefly explain how needle punching loom can consolidate the formed web and describe the various functions of the major components of the needle punching loom. (06 marks)

(b)Using a suitable diagram, briefly explain how Maliwatt technique consolidate/bond the formed nonwoven web and give any two (02) applications of Maliwatt nonwoves. (06 marks)

(c) With reference to the working principles, differentiate Malivlies and Maliwatt web consolidation techniques. (02 marks)

(d)Briefly explain the difference between Malipol and Voltex nonwoven manufacturing techniques. You may no need to draw a diagram. (02 marks)

(Q5) (a) Briefly explain how nonwovens can be consolidated using hydro entangling technique without any thermal energy or chemical adhesives. You may use suitable diagram to explain this. (04 marks)

(b) (i) Briefly explain the how thermal energy can be used to consolidate / bond the formed nonwoven web and state any requirement of raw materials that should be with the used raw materials for thermal bonding technique.
(04 marks)

(ii) Briefly explain how Hot calendaring thermal bonding process is different from other all thermal bonding techniques available. You may refer all thermal bonding techniques available today. (04 marks)

(c) Using a suitable diagram, briefly explain how the "Ultrasonic bonding" can consolidate the formed nonwoven web and also draw a labeled diagram to illustrate the "Radiant heat bonding" used in nonwoven consolidation.
(05 marks)

(d) In chemical bonding, various chemical adhesives / binders are used in consolidation of formed nonwoven webs. State three (03) steps involved with these binders working in chemical bonding. (03 marks)

(Q6) (a) Briefly describe the purpose and method of doing following dry finishing treatments on nonwovens. You may use diagrams whenever need.
(i) Shrinkage (iii) Creeping by Micrex micro creeper
(06 marks)

(b) Briefly explain why splitting, polishing and grinding & velouring are done on nonwovens as finishing treatments.
(06 marks)

(c) Briefly explain the purposes of using following dry finishing treatments in the industry.
(i) Sueding (ii) Softening
(04 marks)

(d) Write short notes on following chemical finishes done on nonwoven textiles.
(i) Flame retardant (ii) Lubricating
(04 marks)