

STUDENT NUMBER Letter

PRODUCT DESIGN AND TECHNOLOGY

Written examination

Monday 13 November 2017

Reading time: 9.00 am to 9.15 am (15 minutes)

Writing time: 9.15 am to 10.45 am (1 hour 30 minutes)

QUESTION AND ANSWER BOOK

Structure of book

Section	Number of questions	Number of questions to be answered	Number of marks
A	13	13	52
B	7	7	38
			Total 90

- Students are permitted to bring into the examination room: pens, lead and coloured pencils, water-based pens and markers, highlighters, erasers, sharpeners and rulers.
- Students are NOT permitted to bring into the examination room: blank sheets of paper and/or correction fluid/tape.
- No calculator is allowed in this examination.

Materials supplied

- Question and answer book of 19 pages
- Detachable insert containing a **design brief** for Section B in the centrefold

Instructions

- Detach the insert from the centre of this book during reading time.
- Write your **student number** in the space provided above on this page.
- You may use diagrams, notes or sketches to help explain your answers.
- Use the space provided in this book for your design brief drawings.
- All written responses must be in English.

At the end of the examination

- You may keep the detached insert.

Students are NOT permitted to bring mobile phones and/or any other unauthorised electronic devices into the examination room.

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SECTION A**Instructions for Section A**

Answer **all** questions in the spaces provided.

Question 1 (3 marks)

The designer, client and end user are all involved in the product design process.

Outline the main role of each person.

	Main role in the product design process
Designer	
Client	
End user	

Use the following information to answer Questions 2–9.

The Greenbo planter

Due to copyright restrictions,
this material is not supplied.

retail cost of Greenbo planter (XL) – \$140.00

retail cost of Greenbo planter – \$80.00

The Greenbo planter, designed by industrial designer Miki Ganor, is a new eco-living product made to hold plants and suit the modern, urban lifestyle. The planters can be used on the banisters, balustrades or fences of apartments, indoor and outdoor restaurants, coffee shops, office spaces and swimming pools. Made from long-lasting, durable, recyclable, high-quality UV¹-protected polypropylene², the planters come in two sizes and more than 10 contemporary colours.

The Greenbo planter has two patented features:

1. an adjustable inner-rail stabiliser mechanism – screws, nails and/or brackets are not needed because the planter has a nylon/metallic cable that wraps around a tube railing and also prevents theft
2. a drainage solution comprising two removable, cleanable and replaceable trays to catch dripping water

Source: images from Greenbo Ltd and Greenbo LLC, <www.greenbo.co>;
text adapted from Greenbo, <www.greenbo.com.au>

¹UV – ultraviolet

²polypropylene – a type of thermoplastic polymer (plastic)

Question 2 (2 marks)

Develop a brief profile of a potential end user of the Greenbo planter.

Question 3 (2 marks)

Name **two** new and emerging technologies and/or processes that could have influenced the design of the Greenbo planter.

Question 4 (3 marks)

The Greenbo planter has product design factors that enhance its form, appearance and feel.

Identify one design principle used in the design of the Greenbo planter and explain how this principle makes the product appealing to an end user.

Design principle _____

Explanation _____

Question 5 (5 marks)

The designer of the Greenbo planter set out to design and produce an innovative product.

a. List three innovative features of the Greenbo planter. 3 marks

1. _____

2. _____

3. _____

b. Explain the importance of innovation in the product development process. 2 marks

Question 6 (3 marks)

Identify three features of the Greenbo planter and, for each feature, identify a value that an end user could place on this feature.

Feature of Greenbo planter	Value placed by end user

Question 7 (1 mark)

Identify the type of manufacturing industry sector that produces the Greenbo planter.

Question 8 (3 marks)

The designer of the Greenbo planter intends to introduce an alternative planter that is more sustainable.

Name and briefly describe one sustainability system that the designer of the Greenbo planter could consider to improve the sustainability credentials of the alternative planter.

Sustainability system _____

Description _____

Question 9 (3 marks)

- a.** Name the manufacturing system that would be used in the production of the Greenbo planter. 1 mark

- b.** Explain why this manufacturing system would be suitable for the production of the Greenbo planter. 2 marks

Question 10 (4 marks)

The design and development of a product is influenced by legal responsibilities.

- a.** List two legal responsibilities that would influence a designer. 2 marks

1. _____

2. _____

- b.** Select one of the legal responsibilities that you have listed in **part a.** and explain how it would influence a designer. 2 marks

Selected legal responsibility _____

Explanation _____

Question 11 (6 marks)

A production plan has a number of components.

List three components of a production plan and describe the role of each.

Component	Role

Question 12 (9 marks)

Choice™ is an Australian organisation that conducts tests on products to provide information that assists consumers to make purchasing decisions. Tests were conducted on different four-person camping tents. Each tent tested was allocated a score; those that gained at least an overall score of 70% were recommended.

In Choice™'s evaluation report, a table was provided that included information about the performance, features and specifications of each tent so that potential tent buyers could make comparisons. The good and bad points of each tent were highlighted.

How Choice™ tested the tents

Useability Our tester rates the tents on how comfortable they are to live in and use, taking into account the useable area of the inner tent and vestibule¹, access to the tent, the number and size of doors and windows and ventilation. Some ventilation around the sides and doors is good, but you don't want too much mesh if you're camping in cold weather, as it'll let in the wind.

Ease of assembly This measures how long it took to put the tents up and take them down. The tester puts up each tent twice, as it's unfair to rate the tent on only the first attempt; it's better to time how long it takes once you know how it works. Times ranged from 11–25 minutes to put up and 10–22 minutes to pull down. These times are only a guide – they're based on an experienced user putting up the tent in ideal conditions. Times will vary depending on your experience, weather and ground.

Rain test We use an artificial rain system (a wide spray of water driven by a large electric fan) to assess each tent for water resistance. Tents score 100% if no water gets into the sleeping area.

¹vestibule – area of the tent between the front opening and its other interior part(s)

Recommended

The overall score was gained by allocating 60% to useability, 20% to ease of assembly and 20% to a rain test. Choice™ recommended tents that scored at least 70% overall and at least 70% for useability.

	Performance					Features					Specifications	
	Price (\$)	Overall score (%)	Useability score (%)	Ease of assembly score (%)	Rain test score (%)	Number of rooms	Number of doors	Number of windows	Awning	Internal storage pockets	Weight (kg)	Warranty (years)
Coleman Instant Up Tent 4 Person	399	91	91	80	100	2	1	3	✓	6	13.4	1
Outdoor Connection Aria 1	1190	88	94	60	100	3	4	2	✓	5	25.9	not stated
Oztrail Fast Frame Cruiser 240	300	82	76	80	100	1	1	3	✓	3	12.5	2
Diamantina Escape Mono Category 5	400	80	78	65	100	1	2	2	✓	8	16.4	5
Darche Air Volution AT4	999	76	70	70	100	1	1	3	✓	0	22.1	1

Recommended

<p>Coleman Instant Up Tent 4 Person \$399 91%</p> <p>Good points</p> <ul style="list-style-type: none"> • Excellent head height and the walls don't slope in much • Solid material almost right around makes it suitable for cold weather • Quick and easy to put up/pull down • Front door can be turned into an awning (poles are supplied but no ropes) <p>Bad points</p> <ul style="list-style-type: none"> • The pegs are thin and fairly short 	<p>Outdoor Connection Aria 1 \$1190 88%</p> <p>Good points</p> <ul style="list-style-type: none"> • Pegs are a good length and thickness • Front door can be turned into an awning and the poles are supplied • Excellent head height and the walls slope in very little • Solid material right around makes it suitable for cold weather • Has two separate bedrooms <p>Bad points</p> <ul style="list-style-type: none"> • Fairly time-consuming to put up/pull down 	<p>Oztrail Fast Frame Cruiser 240 \$300 82%</p> <p>Good points</p> <ul style="list-style-type: none"> • Excellent head height and the walls slope in very little • Quick and easy to put up/pull down • Has permanently set-up awning • Pegs are good length and thickness <p>Bad points</p> <ul style="list-style-type: none"> • The partial mesh walls may not keep the wind out of the sleeping compartment on a cold day
<p>Diamantina Escape Mono Category 5 \$400 80%</p> <p>Good points</p> <ul style="list-style-type: none"> • Front door can be turned into an awning (no poles supplied) • Excellent head height and the walls slope in very little • Solid material almost right around makes it suitable for cold weather <p>Bad points</p> <ul style="list-style-type: none"> • Fairly time-consuming to put up/pull down • The pegs are a good length but thin 	<p>Darche Air Volution AT4 \$999 76%</p> <p>Good points</p> <ul style="list-style-type: none"> • Very good head height and the walls don't slope in much • Fairly quick and easy to put up/pull down • Has a permanent awning • Pegs are a very good length and thickness <p>Bad points</p> <ul style="list-style-type: none"> • The partial mesh walls may not keep wind out of the sleeping compartment 	

Source of boxed text and data (pp. 10 and 11): Chris Barnes, 'Four's a crowd', *Choice*TM, August 2016, pp. 66 and 67; reproduced with permission from choice.com.au, © CHOICETM 2017–2018

- a. Name the method of product evaluation conducted by Choice™. 1 mark

- b. Both qualitative and quantitative methods were used to evaluate the tents.
Compare qualitative and quantitative methods in the evaluation of products. 2 marks

- c. Explain how criteria would be established for the evaluation of the tents. 1 mark

- d. Provide **one** evaluation criterion written as a question. 1 mark

- e. Explain why the three criteria used to calculate the overall score for each tent were given different percentage weightings (that is, 60%, 20% and 20%). 2 marks

- f. Explain how the evaluation report published by Choice™ could help potential tent buyers to determine the quality of the tents. 2 marks

SECTION B

Instructions for Section B

Please remove the insert from the centre of this book during reading time.
 Read the **design brief** insert.
 Select one product that you intend to design and answer the following questions.

Tick (✓) the product that you intend to design.

outdoor public seating for three or more people	
outdoor communal eating table and seating	
drinking fountain in the garden	
outfit for show presenters/announcers	
wearable jewellery for an exhibition in the Conservatory	

Question 1 (4 marks)

Identify and describe two product design factors included in the design brief insert.

Product design factor	Description

Question 2 (4 marks)

Develop one four-part evaluation criterion from the design brief for the product that you have selected.

- The evaluation criterion written as a question

- Its justification and relevance to the design brief

- How it could be achieved

- How the completed product could be tested or checked against the criterion

Question 3 (20 marks)

Draw and annotate a design option for the product you have selected on page 14. Draw your design on this page.

The product that you intend to design _____

Select two processes from your design option.

These two processes must be from the **degree of difficulty list** in the **design brief** insert.

Explain in detail how you would perform the two processes from your design option. You may support your explanation with diagrams.

Process 1 _____

Process 2 _____

Assessment criteria	
i. innovation and creativity in the design option	4 marks
ii. use and explanation of processes, with at least two processes from the degree of difficulty list	4 marks
iii. function/suitability of the design option for intended use	3 marks
iv. use of visual, tactile and aesthetic product design factors in the design option	3 marks
v. annotations, on the design option, that indicate how the requirements of the design brief have been met	3 marks
vi. clarity and detail of drawing in the design option	3 marks

Question 4 (1 mark)

Outline a creative design thinking technique that you could use to generate ideas from the design brief.

Question 5 (3 marks)

Name and describe a method of testing the characteristics and/or properties of materials used in your final design option.

Method of testing _____

Description _____

Question 6 (5 marks)

Risk management during the production of your product (developed from your final design option) is essential.

- a. Identify **one** potential hazard that could occur during production associated with the use of any equipment, tools, materials or machinery. 1 mark

- b. Assess the level of risk associated with this hazard. 2 marks

- c. Explain what control measures you would put in place to minimise the risk. 2 marks

Question 7 (1 mark)

To maintain quality and prolong the life of your product, list the information you would give to the client/end user.

Insert for Section B

Please remove from the centre of this book during reading time.

D E S I G N B R I E F

Ballarat is hosting a National Flower and Garden Show in March 2018 over four days. The show's garden installations, sensational floral designs and innovative gardening products will be exciting for all visitors.

Australian landscape and product designers, florists and young fashion designers will reveal a variety of new products and garden-related experiences for all ages during the show. From fresh flowers and plant features to mouth-watering food and expert presentations, the show will breathe new life into the Ballarat Botanical Gardens and promises to be a fabulous family event.

The directors of this event will showcase flower and garden installations around the grounds of the botanical gardens. Exhibitions, expert demonstrations and presentations will be held in the gardens' Conservatory and Resource Centre. The floral and garden theme will be reflected in every aspect of the show.

The products the directors require for the show must:

- clearly feature and integrate the floral and garden theme
- be suitable for viewing and enjoyment by people with a wide range of needs, including children, the aged and people with disabilities
- be original, innovative and creative.

Select **one** product from the list below.

Product 1

Outdoor public seating for three or more people
<ul style="list-style-type: none"> • maximum measurements of the seating: 450 mm (height) and 500 mm (width)
<ul style="list-style-type: none"> • design must represent/incorporate shapes, textures and colours that reflect the floral and garden theme
<ul style="list-style-type: none"> • two or more materials must be used in the design

Product 2

Outdoor communal eating table and seating
<ul style="list-style-type: none"> • maximum height of the table: 750 mm; maximum height of the seating: 450 mm
<ul style="list-style-type: none"> • design must represent/incorporate shapes, textures and colours that reflect the floral and garden theme
<ul style="list-style-type: none"> • two or more materials must be used in the design

Product 3

Drinking fountain in the garden
<ul style="list-style-type: none"> • maximum measurements of the fountain: 1000 mm (height) and 1700 mm (width)
<ul style="list-style-type: none"> • design must represent/incorporate shapes, textures and colours that reflect the floral and garden theme
<ul style="list-style-type: none"> • two or more materials must be used in the design

Product 4

Outfit for show presenters/announcers
<ul style="list-style-type: none"> • three pieces of clothing – one piece must be a hat or other headwear, one piece is to be worn on the upper body and one piece is to be worn on the lower body
<ul style="list-style-type: none"> • design must represent/incorporate shapes, textures and colours that reflect the floral and garden theme
<ul style="list-style-type: none"> • two or more materials must be used in the design

Product 5

Wearable jewellery for an exhibition in the Conservatory
<ul style="list-style-type: none"> • three pieces of jewellery – one piece must have a fastening or clip
<ul style="list-style-type: none"> • design must represent/incorporate shapes, textures and colours that reflect the floral and garden theme
<ul style="list-style-type: none"> • two or more materials must be used in the design

Your design should include at least **two** processes from the **degree of difficulty list** below.

Degree of difficulty list			
Metal	Polymers (plastics)	Textiles	Wood/Timber
<ul style="list-style-type: none"> • brazing <ul style="list-style-type: none"> – bronze • casting <ul style="list-style-type: none"> – resin – wax • cold bending • enamelling • folding • forging • forming • riveting • rolling • soldering <ul style="list-style-type: none"> – gold alloy – silver • surface decoration <ul style="list-style-type: none"> – engraving • turning (using an engineer's lathe) • welding <ul style="list-style-type: none"> – arc – oxyfuel/gas 	<ul style="list-style-type: none"> • blow moulding • casting • injection moulding • riveting • surface decoration <ul style="list-style-type: none"> – engraving – painting – printing – surface treatment – vacuum metallising • turning (using an engineer's lathe) • vacuum forming 	<ul style="list-style-type: none"> • boning • buttonhole making • collar making • cuff making <ul style="list-style-type: none"> – double cuff – shirt cuff – single cuff with bond opening – single cuff with faced opening – single cuff with placket opening • piping • pleating • pocket making <ul style="list-style-type: none"> – flap/jetted pocket – front hip pocket – inseam pocket – paper bag pocket – patch pocket – welt pocket • rolled hemming • sleeve insertion <ul style="list-style-type: none"> – batwing sleeve – bell sleeve – butterfly sleeve – kimono sleeve – puffed sleeve – raglan sleeve – set-in sleeve • surface decoration • zip insertion <ul style="list-style-type: none"> – centered zip – decorative zip – fly-front zip – invisible zip – lapped zip – open-ended zip 	<ul style="list-style-type: none"> • biscuit jointing • crossed housing jointing • dovetail jointing • dowel jointing • finishing techniques <ul style="list-style-type: none"> – oiling – sanding – staining – varnishing • housing jointing • mortise and tenon jointing • rebate/shoulder butt jointing • routing (decorative edge) • spline and mitre jointing • surface decoration • veneering • wood bending • wood carving • wood turning (using a wood lathe)

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