

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
TOTAL	



General Certificate of Education
Advanced Subsidiary Examination
June 2015

Design and Technology: Systems and Control Technology

SYST1

Unit 1 Materials, Components and Application

Tuesday 2 June 2015 9.00 am to 11.00 am

For this paper you must have:

- normal writing and drawing instruments.

Time allowed

- 2 hours

Instructions

- Use black ink or black ball-point pen. Use pencil only for drawing.
- Fill in the boxes at the top of this page.
- Answer **all** the questions in Section A.
- Answer **one** question from Section B, **either** Question 5 **or** Question 6.
- Answer the question in Section C.
- You must answer the questions in the spaces provided. Do not write outside the box around each page.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information

- The marks for the questions are shown in brackets.
- The maximum mark for this paper is 80.
- There are 20 marks for Section A, 20 marks for Section B and 40 marks for Section C.

Advice

- Illustrate your answers with sketches and/or diagrams wherever you feel it is appropriate.
- You are advised to spend approximately 30 minutes on Section A, 30 minutes on Section B and one hour on Section C.



J U N 1 5 S Y S T 1 0 1

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SYST1

Section A

Answer **all** the questions in this section.

1 (a) (i) Name a suitable lubricant for reducing friction between a shaft and a bearing.

[1 mark]

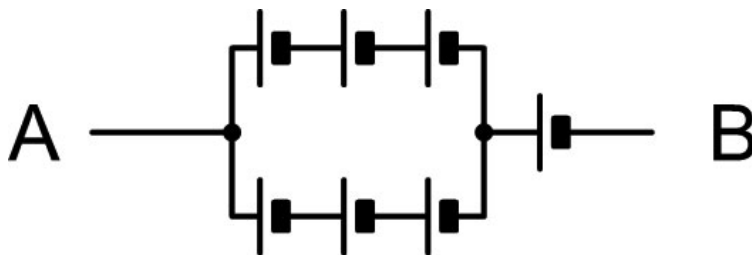
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1 (a) (ii) Name a suitable component for reducing the amount of current flowing in an electrical circuit.

[1 mark]

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1 (b) Calculate the total Potential Difference between points A and B.



All Cells 2 Volts

[2 marks]

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2 Explain the following terms.

2 (a) Mark/space ratio

[2 marks]

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2 (b) A negative going pulse

[2 marks]

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4

Turn over ▶



3

With the aid of an annotated sketch explain how a 25:1 reduction in speed of rotation between parallel shafts can be achieved using only gears with no more than 50 teeth.

[4 marks]

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4



4 (a) Draw a circuit that will operate in the following sequence:

- an SPDT switch is momentarily operated
- a 12 volt light bulb comes on and remains on
- a second SPDT switch is momentarily operated
- the system resets and the light bulb goes off.

[4 marks]

4 (b) Give **two** reasons why a mechanical system cannot be 100% efficient.

[2 × 2 marks]

Reason 1

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Reason 2.....

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8

Turn over ▶



Section B

Answer **either** Question 5 **or** Question 6.

5 (a) (i) Describe in detail a system for producing oscillatory motion with a total movement of 90° . The system should produce **one** complete oscillation every **two** seconds when driven by a 360 rpm electric motor.

Use diagrams to support your answer.

[7 marks]

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5 (a) (ii) With the aid of diagrams, show how it is possible to make the angle of oscillation adjustable to any value between 30° and 90° .

[3 marks]

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5 (b) With the aid of annotated sketches, describe a suitable test that could be carried out to compare the linear expansion of a range of metals for a 100° Celsius rise in temperature.

Your answer should indicate:

- the approximate size of the sample
- the method of producing the required temperature change
- the data that needs to be collected
- the method of collecting the data
- how the data is analysed.

[10 marks]



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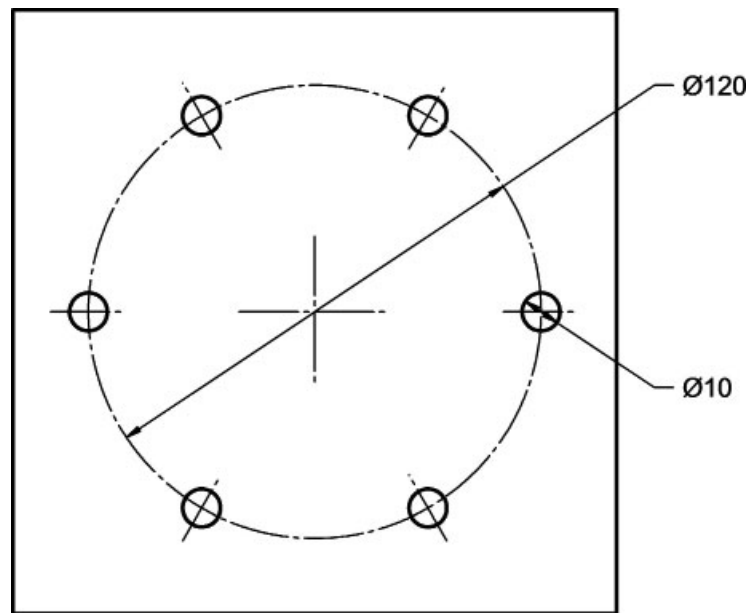


Do **not** answer this question if you have answered Question 5.

- 6 (a)** With the aid of annotated sketches, describe in detail a method of producing the equally spaced holes shown in **Figure 1** in a piece of 6 mm thick aluminium sheet to an accuracy of ± 0.1 mm.

[10 marks]

Figure 1



All dimensions shown are in millimetres.



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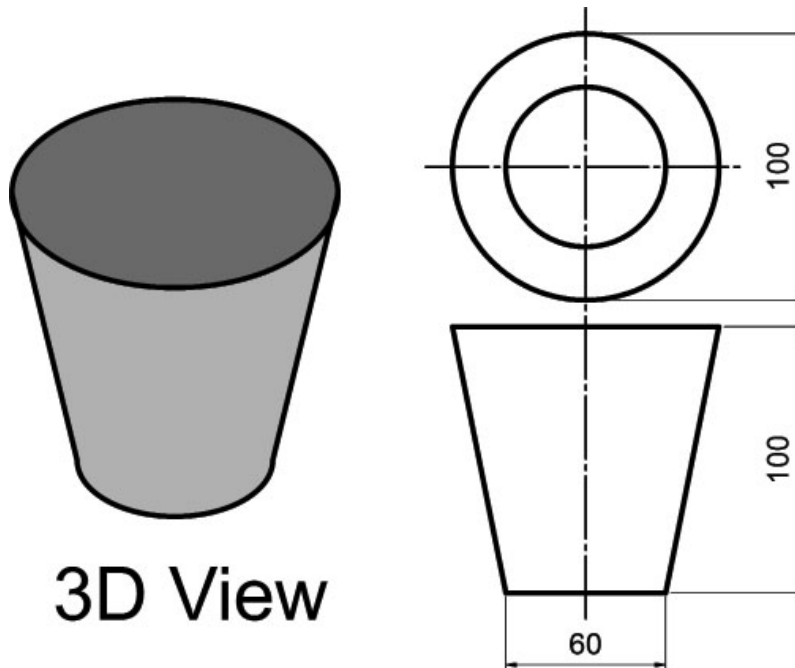
Turn over ▶



- 6 (b) With the aid of annotated sketches, describe in detail how the plastic component shown in **Figure 2** could be produced from 1 mm thick polystyrene sheet.

[10 marks]

Figure 2



3D View

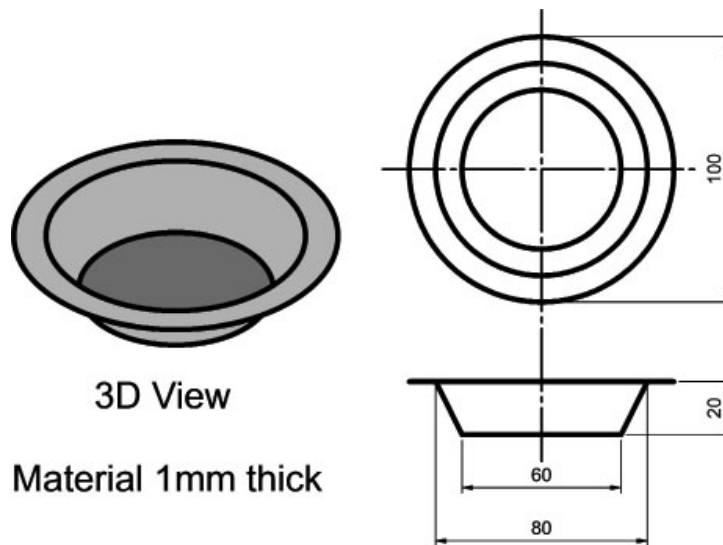
All dimensions shown are in millimetres.



Section C

Answer this question.

- 7 A system is required to automatically deliver a pre-packaged portion of food to a pet. The package is shown in **Figure 3**.

Figure 3 (Pre-packaged food container)

All dimensions shown are in millimetres.



7 (a) (i) Identify **two** hygiene and **two** safety requirements of an automated pet feeding system. **[4 × 1 Mark]**

Hygiene 1

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Hygiene 2

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Safety 1

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Safety 2

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7 (a) (ii) With the aid of a diagram show a system that will produce an electrical pulse of 30 seconds duration once every 12 hours. **[6 marks]**

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7 (b) (i) With the aid of an annotated sketch, describe a system that will automatically produce an output of 100 mm of reciprocating motion each time it receives a short electrical pulse.

[5 marks]

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7 (b) (ii) With the aid of an annotated sketch, describe a system that will automatically produce an output of 90° of rotary movement each time it receives a short electrical pulse.

[5 marks]

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Turn over for Question 7(c)

Turn over ▶



7 (c) Produce a design for a complete system that will automatically deliver food to a pet .

The system should be capable of providing food for a pet for a minimum of three days. Every 12 hours a new container of food should be presented and access to the previous containers prevented.

Your diagrams should clearly show an integrated system with the interaction between the sub-systems explained.

Marks will be awarded for:

- the food presentation and denial system **[2 × 3 marks]**
- the sensing and control system **[6 marks]**
- the dimensioning of the system **[2 marks]**
- the assembly and layout of the sub-systems **[3 marks]**
- the selection of materials, components and fixings methods. **[3 marks]**



Empty box for writing answers.

40

END OF QUESTIONS



There are no questions printed on this page

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