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 2013

Design and Technology: SYST1 Systems and Control Technology

Unit 1 Materials, Components and Application

Tuesday 14 May 2013 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 for drawing only.
- Fill in the boxes at the top of this page.
- Answer **all** 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 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.

Section A

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

1 Explain the following terms and give an example for each.

1 (a) An electrical insulator

Explanation .....

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Example .....

(2 marks)

1 (b) A ferrous metal

Explanation .....

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Example .....

(2 marks)

4

2 Explain the following terms.

2 (a) Frequency

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(2 marks)

2 (b) Fabrication

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(2 marks)

4

3 With the aid of an annotated sketch describe a method of amplifying linear motion by a factor of two.

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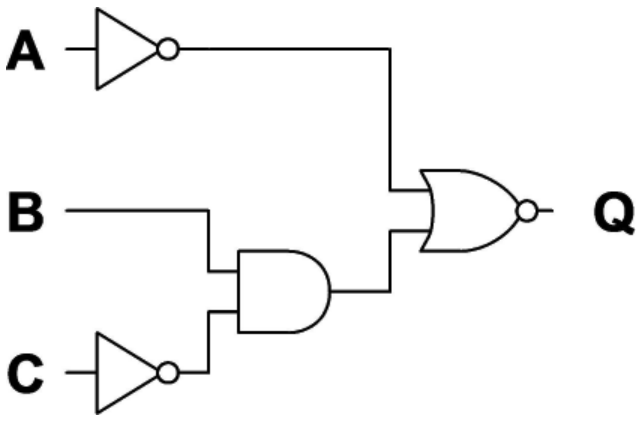
(4 marks)

4

4 (a) Complete the truth table for the circuit shown below.



A	B	C	Q
0	0	0	
0	0	1	
0	1	0	
0	1	1	
1	0	0	
1	0	1	
1	1	0	
1	1	1	

(4 marks)

4 (b) With the aid of a diagram, show a system to switch on a buzzer when the water in a kettle reaches boiling point.

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(4 marks)

8

Section B

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

5 (a) With the aid of diagrams, describe in detail a system for switching on a row of 10 LEDs in sequence at 5 second intervals.

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(12 marks)

5 (b) With the aid of diagrams, explain any modifications that would be required to the system if LEDs were replaced with 20 watt 12v lamps.

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(4 marks)

5 (c) Explain how it would be possible to modify the system so the time period would be adjustable between 1 to 30 seconds. Diagrams may be used to support your answer.

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(4 marks)

20

Do **not** answer Question 6 if you have answered Question 5.

6 (a) With the aid of annotated sketches, describe in detail **two** different methods of cutting a 50 mm by 20 mm rectangular hole in 3 mm thick acrylic sheet to an accuracy of ±0.1 mm.

6 (a) (i) Method 1

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(7 marks)

6 (a) (ii) Method 2

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(7 marks)

6 (b) With the aid of an annotated sketch, describe in detail a method of permanently joining **two** pieces of acrylic sheet together.

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(6 marks)

20

Turn over for Question 7

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

Section C

Answer this question.

7 A system is required to provide slow rotary movement for an animated shop display.

With the aid of a diagram, show **two** electrically powered systems that could be used to turn an output shaft at low speed.

7 (a) (i) System 1

(4 marks)

7 (a) (ii) System 2

(4 marks)

7 (b) (i) With the aid of an annotated sketch, show a system for producing an electrical pulse when a shaft has rotated through an angle of 270 degrees.

(4 marks)

7 (b) (ii) With the aid of an annotated sketch, describe in detail a system that will automatically reverse a motor when it receives an electrical pulse.

(8 marks)

7 (c) Using your ideas from parts 7 (a) and 7 (b) produce a design for a complete system that will rotate a 300 mm turntable at 2 revolutions per minute. After each 270 degrees of movement the turntable should automatically reverse.

Your design should clearly show the turntable, drive system and control system.

Marks will be awarded for:

- the turntable *(2 marks)*
- the turntable's correct speed and movement *(4 marks)*
- the sensing and control system *(6 marks)*
- assembly of the sub-systems *(4 marks)*
- selection of materials and components. *(4 marks)*

END OF QUESTIONS

40

There are no questions printed on this page

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