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 2011

Design and Technology: SYST1 Systems and Control Technology

Unit 1 Materials, Components and Application

Wednesday 18 May 2011 1.30 pm to 3.30 pm

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 Input transducer

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.....

.....

.....

(2 marks)

1 (b) An Output transducer

.....

.....

.....

.....

(2 marks)

4

2 Explain the following terms.

2 (a) Feedback within a closed loop system

.....

.....

.....

.....

(2 marks)

2 (b) Oscillatory motion

.....

.....

.....

.....

(2 marks)

4

3 With the aid of an annotated sketch, describe a method of using heat to permanently join two pieces of metal together.

.....

.....

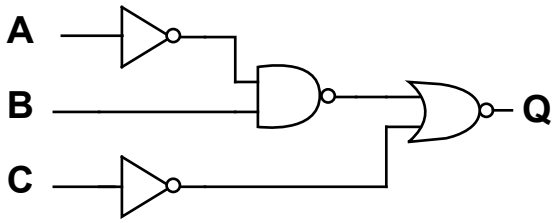
.....

.....

(4 marks)

4

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



A	B	C	Q
0	0	0	
0	0	1	

(5 marks)

4 (b) With the aid of a diagram show how a SPDT switch can be used to provide both a positive and negative signal to the input of a logic gate.

.....

.....

.....

(2 marks)

4 (c) Why is it necessary to ground any unused inputs to a logic gate?

.....

.....

(1 mark)

8

Section B

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

5 (a) Using a diagram, describe **two** different systems for producing a time delay suitable for switching on a 240 volt ac lamp for 10 minutes when a switch is momentarily pushed.

5 (a) (i) System 1

(8 marks)

5 (a) (ii) System 2

(8 marks)

5 (b) Choose one of your systems given in **part (a)**. Explain how it would be possible to make the system *adjustable* so the time period could be any value between 2 and 30 minutes.

(4 marks)

20

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

6 (a) With the aid of annotated sketches describe **two** different methods of transferring and amplifying rotary motion between two parallel shafts.

6 (a) (i) Method 1

(7 marks)

6 (a) (ii) Method 2

(7 marks)

6 (b) With the aid of an annotated sketch, describe in detail how to convert reciprocating motion to clockwise rotary motion.

(6 marks)

20

Turn over for Section C

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

Section C

Answer this question.

7 A system is required to automatically monitor the water level and speed of flow of a river.

7 (a) With the aid of a diagram, show a sensing system that would produce an electrical output proportional to the water level in the river.

(4 marks)

7 (b) With the aid of annotated sketches, show **two** methods of converting the movement of the water in the river into rotary motion.

7 (b) (i) **Method 1**

(3 marks)

7 (b) (ii) **Method 2**

(3 marks)

7 (c) With the aid of an annotated sketch, show a system that would be capable of producing an electrical pulse for each rotation of a shaft.

(4 marks)

7 (d) With the aid of a diagram, show how the number of electrical pulses per minute can be counted and displayed.

(10 marks)

7 (e) Using this page and the next page incorporate your ideas from parts (a), (b), (c) and (d) into a design for a complete system that automatically indicates the level of the river and displays an output to indicate the speed of flow of the water.

Marks will be awarded for:

- materials and construction *(4 marks)*
- how and where the system is placed in the river *(2 marks)*
- assembly of the sub-systems *(8 marks)*
- the indication and display system. *(2 marks)*

40

END OF QUESTIONS

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