

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Question	Mark
A1	
A2	
A3	
A4	
A5	
A6	
B7	
B8	
C9	
TOTAL	



General Certificate of Education
Advanced Subsidiary Examination
June 2009

Design and Technology: **SYST1** Systems and Control Technology

Unit 1 Materials, Components and Application

Tuesday 19 May 2009 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.
- Fill in the boxes at the top of this page.
- Answer **all** questions in Section A.
- In Section B, answer **either** Question 7 **or** Question 8.
- Answer Section C.
- You must answer the questions in the spaces provided. Answers written in margins or on blank pages will not be marked.
- 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.
- 20 marks are allocated to each of Sections A and B and 40 marks to Section C.
- You are reminded of the need for good English and clear presentation in your answers.

Advice

- Illustrate your answers with sketches and/or diagrams where appropriate.



J U N 0 9 S Y S T 1 0 1

SYST1

SECTION A

Answer **all** questions in this section.

1 Giving an example material, explain the term ‘non-ferrous metal’.

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(2 marks)

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2

2 Giving an example material, explain the term ‘thermoforming plastic’.

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(2 marks)

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2



3 A switch is classified as DPDT. Explain, with the aid of a diagram, how this switch works.

(4 marks)

4

4 Using an example of your choice, describe a closed loop control system.

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(4 marks)

4

Turn over ▶



5 With the aid of a sketch, describe a method of converting rotary motion into **reciprocating** motion.

(4 marks)

4

6 With the aid of a sketch, describe a method of converting rotary motion into **oscillating** motion.

(4 marks)

4



SECTION B

Answer **either** Question 7 **or** Question 8.

7 (a) Describe in detail **one** method of producing a Printed Circuit Board (PCB).

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(8 marks)

7 (b) Identify **two** health and safety risks when producing and soldering components onto printed circuit boards **and** state how these risks may be reduced.

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(4 marks)

Turn over ▶



7 (c) Electronic circuits can be prototyped using breadboard or by modelling on a computer simulation package. Compare these **two** methods of prototyping electronic circuits.

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(8 marks)

20



Do **not** answer Question 8 if you have answered Question 7.

- 8 (a) Describe **two** situations where frictional forces are undesirable in mechanical systems **and** explain how they may be reduced.

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(6 marks)

Question 8 continues on next page

Turn over ▶



- 8 (b) Using annotated sketches, describe the operation of **two** types of braking system used on mechanisms or machinery of your choice.

(10 marks)

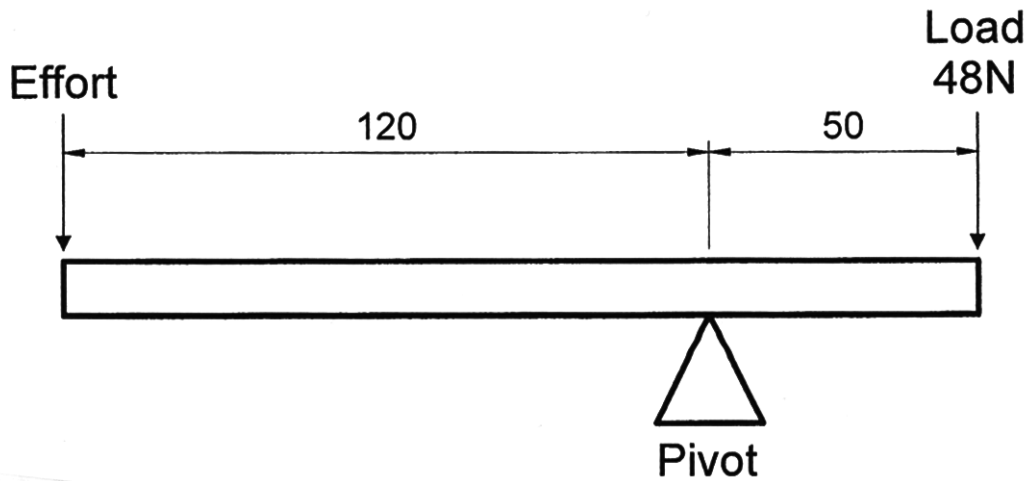


8 (c) A lever is shown in the diagram below.

Given that:

$$\text{Force A} \times \text{Distance A} = \text{Force B} \times \text{Distance B}$$

calculate the effort required to balance the load.



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(4 marks)

20

Turn over for the next question

Turn over ▶



SECTION C

Answer the question in this section.

- 9 The photograph below shows a bollard which can be manually moved to allow a vehicle to drive over it. This is a limited system and requires modifying for improved ease of use.



Height of bollard = 1000 mm

Cross-section of bollard = 80 mm × 80 mm

Mass of bollard = 10 kg



- 9 (a) With the aid of sketches, show a mechanical system that would be capable of slowly lowering the bollard into a hole in the ground. The system should be powered by an electric motor.

(8 marks)

Turn over ▶



- 9 (b) Draw a control circuit that would allow the direction of the motor to be reversed. The circuit must include a method of automatically stopping the motor when the bollard is at the limits of its travel.

(8 marks)



- 9 (c) With the aid of sketches, design a system that would automatically illuminate four LEDs on the bollard during the hours of darkness.

(6 marks)

Turn over ▶



- 9 (d) Incorporate your ideas from parts (a), (b) and (c) to show how the systems could be connected or arranged to operate as a complete unit.

(10 marks)



9 (e) Explain any problems that might be encountered in the installation or manufacture of your system.

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(4 marks)

9 (f) List suitable materials for the major parts of your system including the bollard.

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(4 marks)

40

END OF QUESTIONS



There are no questions printed on this page

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ANSWER IN THE SPACES PROVIDED**

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