AQA

General Certificate of Education
Advanced Subsidiary Examination
June 2010

Design and Technology: SYST1
Systems and Control Technology

Unit 1   Materials, Components and Application

Friday 28 May 2010   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.
● Answer **one** question from Section B.
● 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.
● If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).

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.

1 Explain the following terms and give an example of a specific material for each.

1 (a) An alloy

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(2 marks)

1 (b) A hardwood

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(2 marks)

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2 Explain the following terms.

2 (a) An analogue input

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(2 marks)

2 (b)   A digital display

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(2 marks)

4

3   With the aid of an annotated sketch, show a system with an electrical input and an output of oscillating motion.

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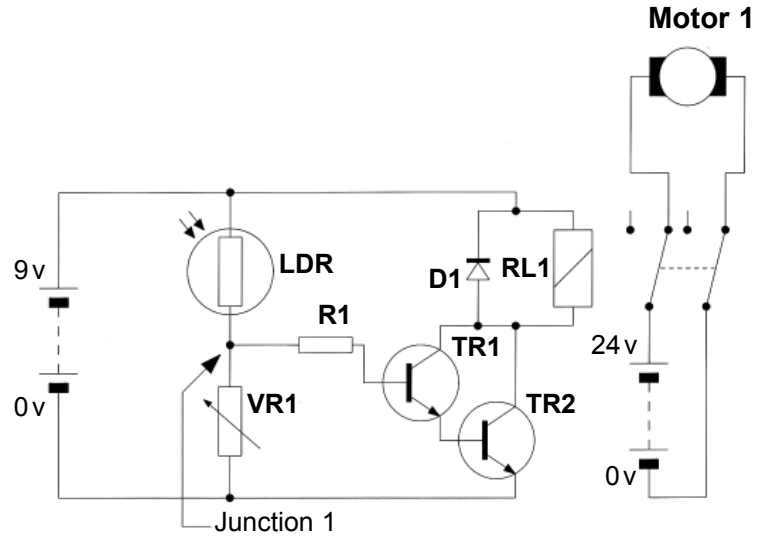
(4 marks)

4

Turn over ▶

4   In the circuit shown below the LDR is in shade and the voltage at Junction 1 is 0.5 volts.

4 (a)   Explain **five** stages of the operation of the circuit when the light level on the LDR increases.

Motor 1

9 v

LDR

D1   RL1

R1

TR1   24 v

0 v   VR1   TR2

0 v

Junction 1

1 ....

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2 ....

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3 ....

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5 ....

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(5 marks)

4 (b) What is the function of the following **two** components in the circuit?

4 (b) (i) Resistor R1

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(1 mark)

4 (b) (ii) Variable Resistor VR1

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(2 marks)

8

Turn over for the next question

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

EITHER

5 (a) (i) Define the term *tensile strength*.

....

....

(2 marks)

5 (a) (ii) With the aid of annotated sketches describe a suitable test that could be carried out to compare the *tensile strength* of a range of *metals*.

Your answer should indicate:
- the approximate size of the sample
- the method of applying the load
- the data that needs to be collected
- the method of collecting the data
- how the data is analysed.

(8 marks)

5 **(b) (i)** Define the term *compressive strength*.

....

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(2 marks)

5 **(b) (ii)** With the aid of annotated sketches describe a suitable test that could be carried out to compare the *compressive strength* of a range of *woods*.

Your answer should indicate:
- the approximate size of the sample
- the method of applying the load
- the data that needs to be collected
- the method of collecting the data
- how the data is analysed.

(8 marks)

20

Turn over ▶

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

OR

6 (a) Use a flowchart to explain the operation of a pedestrian road crossing. Your answer should make reference to:

- the control button for the pedestrian to start the system
- the lights controlling the traffic
- the lights controlling pedestrian movement
- any other indicators you feel should be included.

(10 marks)

6 **(b)** With the aid of a systems diagram, describe in detail the control system for the pedestrian road crossing.
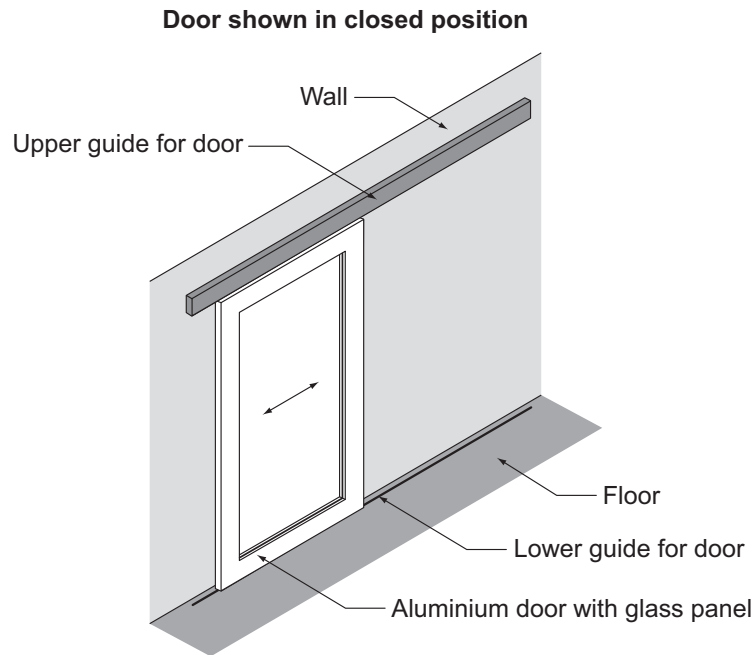
(10 marks)

20

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Section C

Answer the question in this section.

7 The diagram shows a sliding door that is required to open as a person approaches. The door is shown in the closed position.

Door shown in closed position

Wall

Upper guide for door

Floor

Lower guide for door

Aluminium door with glass panel

7 (a) With the aid of an annotated sketch, show how a person approaching the door could be detected and an output produced which would be suitable for activating the door control system.

(6 marks)

7 **(b)** With the aid of annotated sketches, show a sytem that would be capable of *slowly* opening and closing the door.

(8 marks)

Question 7 continues on the next page

Turn over ▶

7 **(c)** With the aid of a diagram, show a control system that would open the door when a person approaches and only close the door when the person has safely passed through.

(10 marks)

7 **(d)** Incorporate your ideas from parts (a), (b) and (c) into a design for a complete system that automatically opens the door when a person approaches and only closes it when they have safely passed through.

Marks will be awarded for:

- materials and construction *(4 marks)*

- assembly of the sub-systems. *(8 marks)*

Question 7 continues on the next page

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7 (e) With the aid of a diagram, show how the movement system is attached and how it moves the door.

(4 marks)

40

END OF QUESTIONS

Question number	Write the question numbers in the left-hand margin

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