General Certificate of Education
January 2003
Advanced Subsidiary Examination

ASSESSMENT and QUALIFICATIONS ALLIANCE

DESIGN AND TECHNOLOGY: SYSTEMS AND CONTROL TECHNOLOGY SCT1
Unit 1 Materials and Components

Thursday 9 January 2003 Morning Session

In addition to this paper you will require:
- an unlined answer book (7024)
- normal writing and drawing instruments.

Time allowed: 1 hour 30 minutes

Instructions
- Use blue or black ink or ball-point pen. Pencil and coloured pencils should be used only for drawing.
- Write the information required on the front of your answer book. The *Examining Body* for this paper is AQA. *The Paper Reference* is SCT1.
- Answer Question 1 and any **two** of Questions 2 to 4.

Information
- The maximum mark for this paper is 100.
- 40 marks are allocated to Question 1, 28 marks to each of Questions 2 to 4, and 4 marks overall for quality of written communication.
- Mark allocations are shown in brackets.
- This paper carries 30 per cent of the total marks for Advanced Subsidiary awards and 15 per cent for Advanced awards.
- You are reminded of the need for good English and clear presentation. The quality of your written communication will be assessed across all questions.

Advice
- Your answers should be illustrated with sketches and/or diagrams wherever you feel it is appropriate.

Answer Question 1 and any **two** of Questions 2 to 4.

1 (a) (i) Using annotated sketches, show in detail **two** suitable systems for automatically *monitoring* linear movement.

(2 x 8 marks)

(ii) Explain the advantages and disadvantages of **each** system.

(2 x 4 marks)

(b) (i) Describe in detail **two** ways in which it is possible to model and test an electronic circuit prior to mass-production.

(2 x 5 marks)

(ii) Describe in detail a process of batch producing a Printed Circuit Board (PCB).

(6 marks)

2 A control system is used in most automatic washing machines. The washing cycle only begins when the following conditions are met,

- the door of the machine is closed
- the drum is filled with water to the correct level
- the water is at the required temperature.

(a) Draw a systems diagram to show how this control system could be achieved.

(7 marks)

(b) Using annotated sketches, show in detail how the **three** conditions could be monitored.

(9 marks)

(c) Draw a logic diagram to show the operation of the system, you must clearly indicate the state of the input devices when the operating conditions are met.

(8 marks)

(d) Draw the symbol and truth-table for a 2 input AND gate.

(4 marks)

3 (a) Describe the advantages and limitations of using analogue systems for:

(i) closed loop control

(ii) open loop control.

(2 x 6 marks)

(b) Describe the advantages and disadvantages of using digital signals for the transmission of data.

(12 marks)

(c) Name and explain the operation of an analogue sensor suitable for detecting temperature change.

(4 marks)

4 (a) Give an example of a permanent and a non-permanent method of joining materials, for each case explain why the method is appropriate.

(2 x 6 marks)

(b) (i) With the aid of sketches show **two** different methods of connecting either a pulley or a gear to a rotating shaft. Your answer should clearly indicate the shaft and pulley/gear material.

(2 x 4 marks)

(ii) Give the advantages and disadvantages of each method of connection given in Part (b)(i).

(2 x 2 marks)

(iii) Describe a suitable process for the manufacture of a pulley.

(4 marks)

END OF QUESTIONS