General Certificate of Education
Summer 2003
Advanced Subsidiary Examination

AQA

ASSESSMENT and
QUALIFICATIONS
ALLIANCE

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

Friday 6 June 2003 Morning Session

In addition to this paper you will require: ● an unlined answer book (7024); ● Insert sheet for use with Question 4(b) (enclosed); ● 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.
● 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.

SCT1

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

1 (a) A set of traffic lights is needed for a narrow bridge to allow alternating one way traffic flow. The light sequence is RED, RED and AMBER; GREEN, AMBER and then back to RED.
With the aid of a flowchart describe the control of the traffic lights. Your answer should make reference to the lights at both ends of the bridge.

(12 marks)

(b) Describe in detail a suitable system that could be used to control the sequence of lights at **one end** of the bridge. Your answer should clearly show how the system is capable of switching lamps on and off which operate from a 230V a.c. supply.

(12 marks)

(c) Describe in detail the advantages of using a programmable control system for the operation of traffic lights that are part of an integrated traffic control system.

(8 marks)

(d) List with reasons **four** criteria that need to be considered when selecting suitable materials for the manufacture of a case to hold the traffic light control circuitry. The case will be mounted next to the traffic lights.

(4 x 2 marks)

2 (a) Breadboards, stripboards and PCBs are all methods of producing electronic circuits.

Describe how and why these different systems may be used at the various stages in the development of a product.

(3 x 8 marks)

(b) Identify **two** possible risks involved in the production of PCB's by etching, in each case suggest a way of minimising the risk.

(2 x 2 marks)

3 With the aid of annotated sketches describe systems that will amplify the following by a factor of 3

(a) Linear movement

(b) Linear force

(c) Angular velocity

(d) Turning force (Torque).

(4 x 7 marks)

4 (a) (i) With the aid of diagrams describe **three** ways of displaying a numerical value as an output from an electronic system.

(3 x 2 marks)

(ii) Describe an appropriate use for *each* of the display systems in Part (a)(i).

(3 x 2 marks)

(iii) Outline the relative advantages of analogue and digital display systems.

(4 marks)
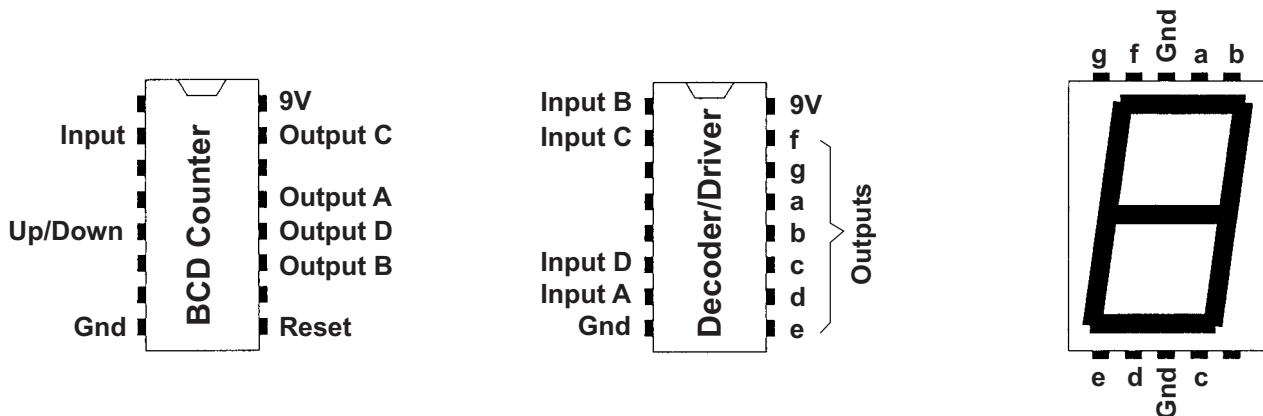
(b) The diagrams below show the following components,

BCD counter.

Decoder Driver.

7 Segment display.

(i) On the insert sheet provided, complete the circuit diagram that will count up by one for each input pulse.

(6 marks)

(ii) Then using only AND gates, show how the circuit can be made to reset to ZERO after 7 input pulses.

(6 marks)

END OF QUESTIONS

Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

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The diagram on this sheet is to be used for answering:
SCT1, Question 4(b)

9V   Input   Gnd