General Certificate of Education
June 2008
Advanced Subsidiary Examination

ASSESSMENT and QUALIFICATIONS ALLIANCE

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

Wednesday 4 June 2008 9.00 am to 10.30 am

For this paper you must have:
- a lined 8-page answer book (AB08) which is provided separately
- normal writing and drawing instruments.

Time allowed: 1 hour 30 minutes

Instructions
- Use black ink or black ball-point pen. Use pencil and coloured pencils 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 **three** questions.
  Answer Question 1 and **two** other questions.

Information
- The maximum mark for this paper is 100.
  Four of these marks will be awarded for using good English, organising information clearly and using specialist vocabulary where appropriate.
- There are 40 marks for Question 1 and 28 for each of Questions 2 to 4.
- The marks for questions are shown in brackets.

Advice
- Illustrate your answers with sketches and/or diagrams wherever you feel it is appropriate.

Answer Question 1.

1 (a) The strap for a wristwatch could be made from either metal or plastic.

(i) Describe **three** advantages of using metal in this application. *(3 marks)*

(ii) Describe **three** advantages of using plastic in this application. *(3 marks)*

(b) Specify a suitable metal from which the watch casing and strap could be made. *(1 mark)*

(c) A house window frame could be made from either wood or plastic.

(i) Describe **three** advantages of using wood in this application. *(3 marks)*

(ii) Describe **three** advantages of using plastic in this application. *(3 marks)*

(d) Specify a suitable plastic from which the window frame could be made. *(1 mark)*

(e) Describe **two** *smart materials* and explain the properties of each that make them *smart.* *(2 × 4 marks)*

(f) Using any number of 20 mm, 40 mm, 60 mm and 80 mm diameter pulleys, sketch and label a pulley system that will amplify:

(i) rotary velocity by a factor of 12. Show your calculations. *(6 marks)*

(ii) torque by a factor of 8. Show your calculations. *(6 marks)*

(g) A stepper motor and toothed belt are often used to achieve accurate positional movement.

Explain why this system is preferable to using a d.c. motor and a flat belt. *(6 marks)*

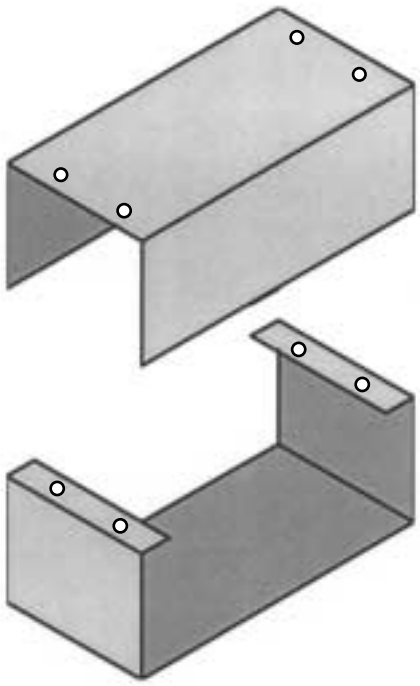
Answer any **two** of Questions 2 to 4.

2 (a) Draw a potential divider circuit incorporating a Light Dependant Resistor (LDR) that will give a HIGH output in the dark. *(4 marks)*

(b) Draw a circuit diagram, incorporating the potential divider you drew in part (a), that will switch ON a 6 V bulb in the dark and will switch it OFF in the light. The circuit diagram should also include a method of switching the bulb ON and OFF independently of the light level.

(6 marks)

(c) The diagram below shows a casing for an electronic circuit to be made from cut and folded aluminium sheet.



(i) Using annotated sketches, describe how the use of a jig can assist in the manufacture of the casing. *(6 marks)*

(ii) Using annotated sketches, describe how the use of a template can assist in the manufacture of the casing. *(6 marks)*

(d) Describe **three** factors that need to be considered when deciding whether to batch produce or mass produce a product. *(3 × 2 marks)*

Turn over for the next question

3 (a) Describe the advantages and disadvantages of using rechargeable batteries rather than non-rechargeable batteries in portable electronic products. *(6 marks)*

(b) Discuss how the use of different forms of transport is affected by society **and** environmental issues. Make specific reference to more than one form of transport. These may include road, rail or air. *(2 × 6 marks)*

(c) Discuss how micro-processor control systems can be used to help maintain the flow of traffic through towns and cities. *(10 marks)*

4 (a) Three lights are advanced from one to another using a push-to-make (PTM) switch.

(i) Draw a circuit diagram that will give a single logic pulse which goes from HIGH to LOW when the PTM switch is pressed. *(6 marks)*

(ii) Explain the operation of the circuit you drew in part (i). *(4 marks)*

(iii) Using the correct symbols, draw in detail a circuit diagram that advances the lights from one to another using the output from your circuit in part (i). *(8 marks)*

(b) The voltage drop across an LED is 2 V and its working current is 20 mA. Calculate the value of the protection resistor required if the LED is to be operated from a 9 V supply. Show your working. (V=IR) *(4 marks)*

(c) Light bulbs and LEDs can be used for indicator lights. Describe the advantages **and/or** disadvantages of the use of light bulbs and LEDs. *(6 marks)*

END OF QUESTIONS