General Certificate of Education
Advanced Level Examination
June 2011

Design and Technology: Systems and Control Technology

SYST3

Unit 3 Design and Manufacture

Thursday 23 June 2011 1.30 pm to 3.30 pm

For this paper you must have:
- an AQA 12-page unlined answer book which is provided separately
- normal writing and drawing instruments.

Time allowed
- 2 hours

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 SYST3.
- Answer **three** questions.
- Answer **one** question from each of Sections 1 and 2, and **one** other question from either section.
- Do all rough work in your answer 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 84.
- There are 28 marks for each question.
- You will be marked on your ability to:
  – use good English
  – organise information clearly
  – use specialist vocabulary where appropriate.

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

Answer **three** questions.

Answer **one** question from each of Sections 1 and 2 and **one** other question from either section.

Section 1

Question 1

0 1 With the aid of annotated sketches describe suitable tests that could be carried out to compare:

- tensile strength across a range of metals
- hardness across a range of metals
- electrical resistance across a range of metals
- resistance to corrosion across a range of metals.

For each test you should indicate:

- the approximate size of the sample
- how the test is carried out
- the data that needs to be collected
- the method of collecting the data
- how the data is analysed. *(4 × 7 marks)*

Question 2

Suggest appropriate *materials* for each of the following products. Give specific reasons for your choice, making reference to the products' function, manufacturing processes and the scale of production.

0 2 The main body of a vice suitable for holding metal *(7 marks)*

0 3 A food preparation board *(7 marks)*

0 4 The lens in a pair of safety goggles *(7 marks)*

0 5 A cooking container suitable for use in a domestic oven *(7 marks)*

Question 3

0 6 With the aid of sketches, describe in detail a method of producing complex 3D forms in *thermoplastic* using a redistribution process. *(10 marks)*

0 7 With the aid of sketches, describe in detail a method of producing complex 3D forms in a *metal* using a forming process. *(10 marks)*

0 8 Describe **four** advantages of using fabrication as a method of producing products. *(4 × 2 marks)*

Turn over for the next question

Section 2

Question 4

0 9 With the aid of sketches describe in detail **two** different methods of converting the energy from the sun into electrical power. Your answer should clearly show the energy conversions that take place. *(2 x 8 marks)*

1 0 Discuss the suitability of gas and wind power as methods of generating electrical energy in the UK. Make reference in your answer to continuity of supply, setup costs, operating costs and pollution. *(12 marks)*

Question 5

1 1 Describe in detail the advantages and limitations of using direct current motors and stepper motors for applications where *precise linear* movement is required. *(16 marks)*

1 2 With the aid of a diagram, show how *accurate angular* movement can be achieved using a direct current motor and a feedback system. *(12 marks)*

Question 6

1 3 Describe with reasons, **four** pieces of anthropometric data that would need to be taken into account when designing a bicycle. Use annotated sketches to support your answer. *(4 x 4 marks)*

1 4 With the aid of sketches, describe in detail a *method* of comparing the performance of bicycle braking systems in a school workshop. *(12 marks)*

END OF QUESTIONS