General Certificate of Education
Advanced Level Examination
June 2015

# Design and Technology: Systems and Control Technology SYST3

## Unit 3 Design and Manufacture

Monday 8 June 2015 9.00 am to 11.00 am

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

A

**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 **Paper Reference** is SYST3.
- Answer **three** questions.
- Answer **one** question from **each** of Sections 1 and 2, and **one other** question from **either** section.
- If you choose to answer a question which has several parts, you should answer **all** parts of the question.
- Do **all** rough work in your answer book. Cross through any work that 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.

For each question that you answer, you should answer **all** parts of that question.

## Section 1

### Question 1

**0 1** Discuss the relative advantages of using finite and non-finite energy sources for meeting the energy requirements of communities on isolated islands in the UK.

**[16 marks]**

**0 2** Describe in detail how **two** of the following could be used to charge a 12 volt battery on an ocean going yacht.

- Wind power
- Solar power
- The yacht's movement through the water

Your answer should make reference to harnessing the power source, energy conversion and how a suitable output is produced.

**[2 × 6 marks]**

### Question 2

**0 3** With reference to a range of applications, compare the relative advantages of **three** different systems for the transfer and amplification of rotary motion.

**[16 marks]**

**0 4** With reference to specific examples, explain when and why you would use anthropometric data related to 90% of the population.

**[8 marks]**

**0 5** Discuss why using the average measurements of a representative sample of the population is not necessarily a good idea when designing seating.

**[4 marks]**

**Question 3**

**0 6** With reference to a different system or product for each property, explain in detail why the following are important in material selection.

- Conductivity
- Hardness
- Tensile strength
- Toughness

**[4 × 4 marks]**

**0 7** Discuss the environmental advantages and performance limitations of electrically powered vehicles.

**[12 marks]**

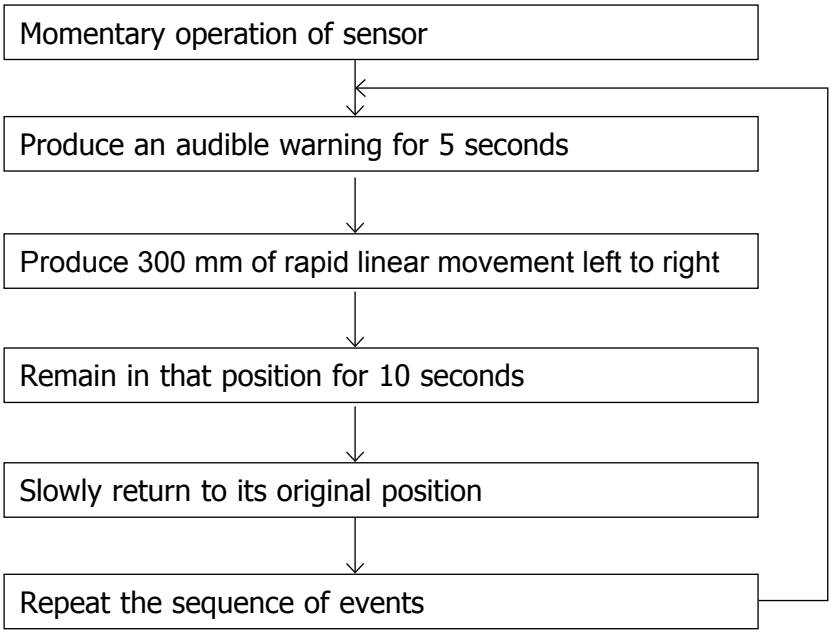
**Turn over for Section 2**

## Section 2

### Question 4

**0 8** With the aid of annotated sketches, describe a system that would perform the sequence shown in **Figure 1**.

**Figure 1**




**[16 marks]**

**0 9** With reference to specific systems or products, discuss the factors to be considered when deciding on suitable methods to use for joining metals.

**[12 marks]**

### Question 5

**1 0** With the aid of diagrams, describe how the output from a microcontroller can be used to produce bi-directional rotary movement to an accuracy of 0.1 of a degree.

**[16 marks]**

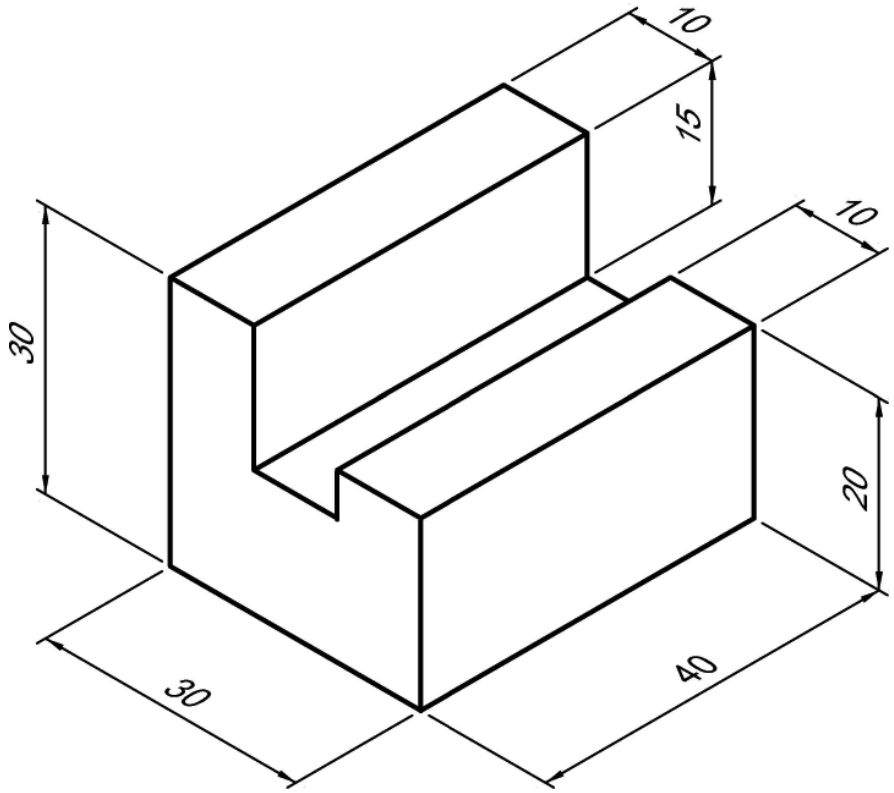
**1 1** With the aid of diagrams, explain in detail how it is possible to monitor and display a temperature range of 0 – 60° Celsius using a microcontroller.

**[12 marks]**

**Question 6**

**1 2** With the aid of annotated sketches, describe in detail how the plastic component shown in **Figure 2** could be accurately fabricated from 10 mm acrylic sheet.

**Figure 2**




All dimensions shown are in millimetres.

Your answer should make reference to:

- production of the separate pieces
- suitable joining methods
- how the required level of accuracy is achieved
- the stages in the production process
- the processes, tools and equipment used.

**[12 marks]**

**1 3** With the aid of annotated sketches describe in detail how the component shown in **Figure 2** could be mass produced using a deformation/redistribution process from a suitable variety of plastic (polymer).

**[16 marks]**

**END OF QUESTIONS**

**There are no questions printed on this page**

**There are no questions printed on this page**

**There are no questions printed on this page**