



General Certificate of Education  
Advanced Level Examination  
June 2013

# Design and Technology: Systems and Control Technology

## SYST3

Unit 3 Design and Manufacture

Tuesday 4 June 2013 9.00 am to 11.00 am

**For this paper you must have:**

- an AQA 12-page unlined answer book
- 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.
- If you choose to answer a question which has several parts, you should answer **all** parts of this question.
- 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.

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Answer **three** questions.

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

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

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### Section 1

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#### Question 1

**0 1** Industrial manufacturing causes many different forms of pollution. With reference to **four** specific examples, explain the types of pollution and the effects these have on the environment. (4 x 5 marks)

**0 2** Describe the relative advantages of **two** different types of lubrication. (8 marks)

#### Question 2

**0 3** Discuss why bridges are normally assembled on site from fabricated parts that are manufactured elsewhere. (12 marks)

**0 4** With the aid of annotated sketches describe how anthropometric data is used when deciding on **two** adjustment requirements and **two** design requirements of a driver's seat. (4 x 4 marks)

#### Question 3

**0 5** With the aid of annotated sketches describe suitable tests that could be carried out to compare the following properties of a range of metals.

Flexibility

Thermal conductivity

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 and equipment used
- how the data is analysed.

(2 x 8 marks)

**0 6** With the aid of annotated sketches describe in detail how the small gear wheel shown below could be manufactured in quantity, from a specific material of your choice.



(12 marks)

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**Section 2**

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**Question 4**

- 0 7** A PIC based system is required that will illuminate eight LEDs in sequence at three second intervals after a switch has been momentarily pressed.  
Draw a labelled circuit diagram for this system. *(10 marks)*
- 0 8** With the aid of a flowchart explain the required PIC programme. *(12 marks)*
- 0 9** With the aid of a diagram explain in detail how and why the circuit would need to be modified if one of the LEDs was replaced by a 240 volt ac lamp. *(6 marks)*

**Question 5**

- 1 0** A system is required to automatically maintain the temperature level in a home to a value set by the user. Use a flowchart to explain the operation of this system.  
Your answer should make reference to:
- the cooling system
  - the heating system
  - the temperature set by the user
  - the temperature sensor. *(10 marks)*
- 1 1** With the aid of diagrams, describe in detail a system that would provide this function. Your answer should clearly indicate how heating and cooling is achieved and how these processes are controlled. *(12 marks)*
- 1 2** Discuss the advantages to a homeowner of insulating their house. *(6 marks)*

**Question 6**

- 1 3** With the aid of an annotated sketch, describe in detail a system for continuously producing 200 mm of reciprocating motion at a constant velocity. *(12 marks)*
- 1 4** When the power supply to an electric motor is removed the motor shaft still continues to rotate. With the aid of annotated sketches describe **two** different methods of automatically bringing the motor shaft to a standstill as quickly as possible. *(2 x 8 marks)*

**END OF QUESTIONS**

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