General Certificate of Education
Advanced Level Examination
June 2012

Design and Technology: Systems and Control Technology

SYST3

Unit 3 Design and Manufacture

Wednesday 13 June 2012 1.30 pm to 3.30 pm

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.

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.

Section 1

Question 1 Answer all parts of this question

0 1 Control and movement may be achieved by *electrical*, *mechanical* or *pneumatic* systems. Compare the advantages and limitations of **each** system, giving an example of where each might be used. *(3 × 8 marks)*

0 2 Explain the advantages of a closed loop control system for ensuring accuracy in manufacturing situations. *(4 marks)*

Question 2

0 3 With the aid of annotated sketches, explain in detail the operation of **four** *different* systems/devices that require a high level of frictional force for their operation. Your answers should clearly indicate how this high frictional force is achieved and why it is necessary. *(4 × 7 marks)*

Question 3 Answer all parts of this question

0 4 Sketch and describe the operation of **two** *different* systems for converting rotary motion into reciprocating motion. Name a suitable application for each. *(2 × 6 marks)*

0 5 Sketch and describe the operation of **two** *different* systems for transferring rotary motion between perpendicular rotating shafts. Name a suitable application for each. *(2 × 5 marks)*

0 6 Give **two** reasons why mechanisms are not 100% efficient and suggest how the efficiency might be improved. *(2 × 3 marks)*

Section 2

Question 4 Answer all parts of this question

0 7 With the aid of sketches, describe in detail a method of converting the energy from the wind into electrical power. Your answer should clearly show the energy conversions that take place. *(10 marks)*

0 8 With the aid of sketches, describe in detail a method of converting the energy from tidal rise and fall into electrical power. Your answer should clearly show the energy conversions that take place. *(10 marks)*

0 9 Discuss the advantages and disadvantages of using fossil fuels as a method of producing electrical energy in the UK. *(8 marks)*

Question 5 Answer all parts of this question

1 0 With the aid of an annotated sketch, describe how a double acting cylinder could be made to extend slowly when a light beam has been broken and retract quickly when the light beam is reinstated. *(16 marks)*

1 1 With the aid of a diagram, show a system that could automatically count and display the number of revolutions of a shaft in one minute. *(12 marks)*

Question 6

1 2 With the aid of annotated sketches and reference to specific examples/situations, describe in detail four different systems for *transferring* and *amplifying* the following:

- speed of rotation
- torsional force
- linear distance moved
- linear force.

In each case you should state the limitations of the system chosen. *(4 × 7 marks)*

END OF QUESTIONS

There are no questions printed on this page