GCE AS/A level

1111/03

S16-1111-03

DESIGN AND TECHNOLOGY – DT1
Systems and Control Technology

A.M. MONDAY, 23 May 2016

2 hours

ADDITIONAL MATERIALS

In addition to this examination paper, you will need a 12 page answer book.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Answer **five** questions from Section A.

Answer **one** question from Section B.

INFORMATION FOR CANDIDATES

When and where appropriate, answers should be amplified and illustrated with sketches and/or diagrams.

Section A is designed to demonstrate your **breadth** of knowledge in Systems and Control Technology.

Section B answer should be substantial and demonstrate your **depth** of knowledge in Systems and Control Technology.

You are reminded that assessment will take into account the quality of written communication used in answers that involve extended writing **(Section B)**.

Candidates are reminded of the necessity for good English and orderly presentation in their answers.

SECTION A

Answer **five** *questions from this section.*

This section is designed to demonstrate your **breadth** *of knowledge in Systems and Control Technology.*

Each question carries 8 marks.

1. *(a)* Identify **two** smart materials and state how they are used in modern control systems. 2 x [2]

(b) Describe the advantages of using these smart materials in named products. [4]

2. Patents, Copyrights, Registered Trade Marks and Design Rights are all forms of design protection granted by the Patent Office.

Explain the features and level of protection of any **two** of these with reference to specific products. 2 x [4]

3. All designers consider the use of ergonomics and anthropometrics in order to design successful electronic or mechanical devices.

Describe using examples why:

(a) ergonomic principles are important in the design of electronic or mechanical devices; [4]

(b) anthropometric data is important in the design of electronic or mechanical devices. [4]

4. *(a)* State **two** benefits of using circuit simulation software when developing a design proposal. [4]

(b) State **two** benefits of making a final three-dimensional prototype prior to manufacturing. [4]

5. *(a)* Sketch a diagram which includes the components needed to trigger an input to a microcontroller and describe the roles of the components required. [4]

(b) Using notes and sketches explain how a microcontroller is able to activate a 1 amp motor. [4]

6. Reverse engineering involves the disassembly of a product.

Explain in detail how product disassembly benefits the designer. [8]

7. *(a)* Explain why bought-in or standardised part-assembled components are used when manufacturing products. [4]

(b) Describe **one** advantage and **one** disadvantage of using bought-in or standardised part-assembled components to the designer or manufacturer. 2 x [2]

8. The use of Computer Aided Design (CAD) and Computer Aided Manufacture (CAM) has now become an integral part of the design process for both designers and manufacturers when creating products.

(a) Describe the benefits of using CAD to the designer. [4]

(b) Describe the benefits of using CAM to the manufacturer. [4]

SECTION B

Answer **one** *question from this section.*

Your answer should be substantial and show the **depth** *of your knowledge in Systems and Control Technology.*

Each question carries 30 marks.

9. Production lines rely on getting the right material or component delivered at the right time and place. This is often referred to as 'Just in Time' (JIT).

Describe the importance of this and explain how it is achieved along with the advantages to the manufacturer. Use examples of products to fully explain how this principle is used to its full effect. [30]

10. Discrete components are being replaced by Integrated Circuits (ICs) in control systems.

Discuss the benefits of ICs for the manufacturer, the environment and the end user. [30]

11. Discuss how trends, styles and new technical capabilities have all influenced the design, production and sale of products. [30]

END OF PAPER