

354/03

DESIGN AND TECHNOLOGY
SYSTEMS AND CONTROL TECHNOLOGY DT4

P.M. TUESDAY, 19 June 2007

(3 Hours)

ADDITIONAL MATERIALS

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

INSTRUCTIONS TO CANDIDATES

Answer **three** questions from Section A.

Answer **four** questions from Section B.

Answer **two** questions from Section C.

INFORMATION FOR CANDIDATES

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

Section A and **Section B** answers should be no more than half a page. These sections are designed to demonstrate your **breadth** of knowledge in Systems and Control Technology.

Your **Section C** answers should be substantial and demonstrate your **depth** of knowledge in Systems and Control Technology.

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

SECTION A

Answer **three** questions from this section.

The maximum length of each answer should be no more than about 150 words.

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

Each question carries 8 marks.

1. (a) Describe the *product life cycle* of a product that includes a system. [4]
(b) Draw a labelled diagram demonstrating the life cycle of a product with a slow rate of adoption. [4]
2. For a named product of your choice, identify **two** *incremental improvements* and briefly describe the impact **each** has had on the function or performance of the product. [2 × 4]
3. The use of the AND gate provides certain opportunities for systems designers.
(a) Draw the logic symbol and truth table for the AND gate. [4]
(b) Describe an application where a systems designer could make use of an AND gate. [4]
4. Explain how the use of microcontrollers in products can have a positive impact on the environment. [8]
5. Describe how *planned obsolescence* can often have an effect on the quality of the control systems within a product. [8]

SECTION B

Answer **four** questions from this section.

The maximum length of each answer should be no more than about 150 words.

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

Each question carries 8 marks.

6. Explain what you understand by the term *Intellectual Property*. [8]
7. Name a management system for product manufacture and describe how that system can address quality control when used in the production process. [8]
8. When designing a complex flowchart, the systems designer will often use macros or sub routines. Illustrate this strategy and analyse the advantages of this approach. [8]
9. Simple and compound gear systems can be used by systems designers for specific applications.
- (a) Describe, with the aid of diagrams, the difference between simple and compound gear systems. [4]
- (b) Name a product that functions through the use of a simple or compound gear system and explain why the designer has used this system. [4]
10. (a) Explain what is meant by the term *ergonomics*. [4]
- (b) Show how ergonomic considerations are vital to the successful development and use of a specific named product. [4]
11. Name four smart materials and describe the characteristics that enable them to be classified as *Smart*. [4 × 2]

SECTION C

Answer *two* questions from this section.

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

Each question carries 22 marks, 2 of which are for clarity of communication.

12. Identify a specific product, or a range of products and give a detailed account of the changes in design and/or styling that have been attributed to a product designer or design movement, from the 1970s onward. [22]
13. Miniaturisation is a design trend often apparent in revitalised systems and control products. Analyse this statement and comment on the effect this has on the success of named products in the market place. [22]
14. “...passively complying with environmental laws is not the same as actively designing to improve the environmental performance of a product.”
(Edwin Datschefski – *The Total Beauty of Sustainable Products* – RotoVision 2001)
Discuss how product designers can become active designers in improving the environmental performance of products they design. [22]
15. The *Four Ps* are features which can have a significant impact when selling products in the market place.
Describe the essential features of **each** of the *Four Ps* and relate them to a product of your choice, indicating how each influences the marketability of the product. [22]
16. Describe how recent developments in ICT have had a major influence on the modelling and prototyping of products that use control systems. [22]