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General Certificate of Secondary Education

Design and Technology: Electronic Products 45401

Unit 1: Question Paper

Report on the Examination

2011 examination – June series

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General Comments

This is the second year that the new Electronic Products specification paper has been taken by candidates. Whilst last year saw a relatively few candidates sitting the paper for the first time, the entry for 2011 was vastly increased. The paper was written to enable candidates of all abilities to demonstrate their ability. Within each question was a structure to provide increasing demand for levels of detail, knowledge and application.

In common with all other Design and Technology specifications, section A of the paper is approximately 25% of the total marks and is design based. The questions were themed on retail environments and the security of products. This would have been an area of experience that most candidates would have some familiarity.

The preparation sheet was sent to centres in advance allowing scope for adequate preparation.

Section A
Question 1

(a) This part of the question provided a starting point for candidates to think about systems, and develop some initial ideas in response to a set specification. This was based on INPUT – PROCESS – OUTPUT analysis of ideas. Most candidates achieved some marks.

(b) This part of the question enabled candidates to clarify their thinking on how their system might work. Sufficient detail was needed to attain full marks.

(c) Parts (a) and (b) allowed candidates to develop a fuller design proposal and use their ideas and knowledge to influence their work. Many gained more than half the available marks. Examiners saw a wide range of capability and some outstanding graphic communication also. Nearly all answers comprised of drawn diagrams and sketches and included annotated design proposals that variously met the criteria set.

(d) This part asked for an evaluation of their design. This process was well understood with 70% of candidates gaining a mark of 3 or 4.

(e) This question asked for a detailed understanding of the advantages and disadvantages of utilising batteries in the product. Almost all candidates were able to make sound comments on batteries gaining good scores of 2-4 marks.

Most candidates seemed able to cope with the design process in the context of security devices and this was reflected in their marks.

Section B

Question 2

a) i) These first two parts provided a familiar start to an extended question. Two thirds of responses gained a mark for correctly identifying an LDR.

a) ii) When asked to suggest a suitable application and use for the transducer, this figure dropped to just about half.

a) iii) Interpolating and describing the behaviour of the LDR from the graph given, enabled almost all candidates to gain 1 or 2 marks.

b) i) The circuit diagram featuring a variable resistor and LDR as a potential divider proved more challenging, with just half of candidates able to score 1 or 2 marks available.

b) ii) This question built on the LDR understanding and extended candidates to discuss photo transistors. Only 20% were able to do so.

c) i) Very few candidates could identify an opto-isolator.

c) ii) Only a minority of candidates were able to go on to give a suitable use and/or application for the device.

Question 3

a) This question was a circuit schematic, asking candidates to complete the wiring connections for a specified IC (4017) and components. A majority of the entry achieved half marks or more and many diagrams were carefully drawn.

b) (i) Switch bounce and its problems was not well understood by the majority of candidates.

b) (ii) Remarkably very few answers went on to suggest ways of eliminating switch bounce, which is common in digital counting circuits.

Question 4

This question was structured around a basic latching circuit. This is a popular circuit design when building alarms in school.

a) i) Over half of candidates were able to correctly identify the SCR or Thyristor in the diagram

a) ii) Less than 1/3 of responses were able state a purpose or use for a thyristor.

b) Understanding the need to maintain a current flow in this circuit does not seem to be well understood, and only the most able candidates answered correctly.

c) Candidates gained marks by relating using the PTM switch to latching.

d) Less understood was the need for a second PTM to reset the Thyristor and turn its latching action off.

e) This extended candidates, who needed to explain the latching process and gate voltage requirements of a Thyristor.

Question 5

This question was about microcontrollers.

a) In this part of the question candidates named three domestic products/ or devices featuring microcontrollers.

b) Giving 1 or 2 positive attributes for microcontrollers proved a little harder, although the majority of candidates did score some marks.

c) Understanding the relative advantages of programming in BASIC or using Flowcharts saw around 70% of responses achieve some marks and 20% achieve full marks.

d) The last part of this question on microcontrollers asked candidates to write or draw a program to control the output of three LEDs. This did prove difficult for many but there was good understanding in the responses of the more able who achieved full marks. This underlines the need to practice and develop some microcontroller theory alongside application capability.

Question 6

This focused on the 555 timer IC.

a) When considering timing in circuits, the majority were easily able to give a good reason for a monostable/single shot time delay.

b) In this part the means of varying the time delay was to be discussed and around 2/3 of candidates were able identify the resistor and capacitor.

c) i) This part required understanding of circuit calculations.
More than half of candidates recalled the Time Constant formulae.

c) ii) Again nearly half of responses were able to use the calculation and formulae with values included.

c) iii) Calculating the correct value for a timing resistor proved slightly more challenging with around a third correct values derived.

c) iv) The pull up resistor shown earlier in the question required a suggested value. A good suggested response was gained from more than half the answers.

c) v) Unfortunately only a few candidates knew the name and proper function of a pull-up resistor in this application.

Question 7

This question draws on digital and logic understanding

a) i) Nearly half of responses correctly identified the OR gate

a) ii) When asked to complete the truth table for the OR gate, over 90% were able to gain 1 or more marks.

b) Understanding the difference between Digital and Analogue signals is an important aspect of students experience. The majority of candidates showed some understanding with many gaining full marks.

Question 8

This question focused principally on manufacturing a product

a) When considering the design factors to consider, almost two thirds of candidates achieved the maximum mark.

b) i) This part of the question looks at Infra Red as a design consideration looking at its advantages- most gave a suitable response.

b) ii) In this part a disadvantage of Infra Red is asked for – again most were able to correctly suggest a suitable disadvantage such as limited operating range.

c) This question was a very broad and sought to test a range of written responses about the design and development of a batch produced product. Marks were also available for quality of written communication.

d) Generally this question was the least well answered, this may have been due to its position in the paper, but candidates need to be better prepared for this type of question which requires a single written response.