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Design and Technology: Electronic Products 45401

(Specification 4540)

Unit 1: Written Paper

Report on the Examination

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General Comments

This is the third year that this Electronic Products specification paper has been taken by candidates and, therefore, both centres and candidates should be familiar with the general structure and format of the paper.

The question paper was untiered and enabled candidates of all abilities to access a range of questions. The paper provided opportunities for candidates to demonstrate their knowledge and understanding across the breadth of the subject content.

Section A of the question paper comprises approximately 25% of the total marks and is design based. The preliminary material was sent to centres in advance allowing broad scope for adequate preparation of candidates.

It is really important to teach the breadth of the specification through a range of practical experiences and formal lessons and not just rely on acquiring knowledge application and understanding through the controlled assessment component.

Section A

Question 1

(a) This was a 6 mark question and required candidates to focus on the task and provided a useful starting point for candidates to get straight into problem solving, requiring them to think about systems, and developing ideas in response to a set specification.

This was based on INPUT – PROCESS – OUTPUT and was a similar format to last year. All candidates achieved well on this question with more than two thirds of them gaining more than half marks.

(b) This part of the question allowed candidates to develop some initial design ideas and respond to a number of specification points. Generally well drawn and annotated responses were seen.

(c) This part of the question focussed on the details of an electronic system, enabling candidates to demonstrate their understanding of how an electronic system or system block diagram could be designed.

(d) This was the part of section A that provided an opportunity for candidates to respond fully to the design question. As with previous parts this question was explored fully by many candidates. Of these, 44% achieved half marks or more, but only a relatively small proportion achieved the top two marks. Almost all candidates used all of the available space to explore ideas and proposals. Almost all the answers comprised drawn diagrams and sketches and included annotated design proposals that variously met the criteria.

Most candidates seemed able to cope with the design process in the context of table top games and this was reflected in the marks awarded.

Section B

Question 2

This question was the least well answered of all the questions available, which is a surprise given the structured nature of the questions. Attention is drawn to the need to ensure that all of the subject content is covered.

(a) This looked at a schematic for a Field Effect Transistor, in common use in electronics as a switch, amplifier and interface for circuits. Very few candidates knew the name of any of the leads or connections

(b) Although not a significant number, there were relatively more candidates that knew why an interface was required for digital circuits.

(c) (i) A significant number of candidates gained one mark or more for placing a diode to protect a circuit from back EMF. Most, however, were only able to draw the component schematic; with a minority knowing that it needed placing in parallel with the load.

(c) (ii) Very few candidates could suggest accurately why a relay would be used in a circuit.

(c) (iii) This question about a Darlington pair transistor circuit was well known to many candidates and many were able to respond positively to the reasons for using and applying this type of configuration

Question 3

This question focused on circuit design and construction from prototyping to PCB manufacture.

(a) (i) Breadboard prototyping was familiar to the majority of candidates who responded positively with the vast majority of them gaining at least one mark.

(a) (ii) In line with the previous response to breadboard circuits most candidates were able to explain some or all of the detail and advantages of CAD in designing circuits.

(b) This was less well known to some candidates and fewer than half of them were able to positively respond to the reasons for using surface mount components in circuits and circuit designs.

(c) Many candidates did identify with how surface mounted components are fixed to a PCB and many were able to gain one or more marks.

(d) This part of the question pursued further detail about when not to use surface mount components and difficulties in using them. This was challenging and yet many responded positively.

(e) This extended question was intended to test candidates' knowledge of the stages in PCB production that should have been familiar to them. In fact 80% of candidates gained one or more marks and over 40% gained more than half marks.

Question 4

This question focussed on smart materials and product life and elicited a range of responses. Smart materials are now a well known aspect of Design &Technology teaching, as is the concept of product life span and design life.

(a) Relatively few candidates were able to convincingly explain their understanding of any smart material with just one in five gaining full marks. Those that answered positively were able to describe fully the nature of smart material properties and gave good examples of types and behaviour.

(b) A table of smart materials was given that could have prompted more positive responses for the above question. In practice this question was again unfamiliar to many with only 40% gaining at least one or more marks from six available. QTC, electro-luminescent wire/film and photo voltaic cells are widely available in schools and should be familiar to many candidates.

(c) (i) Encouragingly 45% of candidates knew enough to respond to this question on planned obsolescence and give a reasoned answer. This is, like smart materials, a fundamental aspect of real world electronic products.

(c) (ii) A similar number of candidates were also able to identify consumer strategies to reduce the impact of obsolescence and gave good reasoned ways of doing so.

Question 5

This question was about generating pulses and signals and provided a number of opportunities for candidates to respond well.

(a) Over 80% of candidates were able to correctly identify the main types of electronic sub system in signals generation.

(b)(i) This was a 555 timer schematic and required the candidates to correctly connect components to the output pin to achieve a flashing output. As with part (a), 80% of candidates were able to achieve one or more marks and one in five achieved maximum marks.

(b)(ii) This part of the question focused on the output signal shape and detail. Over 50% of candidates could draw a square wave, rather less were able to label its features. Only a small proportion of candidates achieved the maximum available mark.

(b)(iii) This part of the question tested candidates understanding of how components interact in a time delay circuit requiring a simple formula to be applied. Nearly 75% of candidates gained some marks and used the correct formula. Transposing the component values and calculating the correct time delay were slightly more challenging.

Question 6

This question was about microcontrollers.

(a) Nearly 70% of candidates could give one or more advantage for using a microcontroller. One in six could easily state three reasons.

(b) More than half of all candidates understood why an IC socket might be used with a microcontroller and were able to explain why.

(c) (i) Only 37% of candidates could correctly state a suitable voltage for powering microcontrollers.

(c)(ii) Although this part of the question was 'overleaf' from the main part on voltages, it followed on the theme requiring candidates to correctly name a suitable device for dropping voltage to drive digital circuits. This was poorly answered with only 12% correctly identifying a voltage regulator or 7805 device.

(d)(i) This part of the question directs candidates to develop a simple flow chart or basic program in response to a program specification. Encouragingly, over 60% gained one or more marks available and 40% gained full marks. This part of the question was based principally around a decision box. The concept of using flow charts/diagrams is familiar to many even if block symbols used are highly variable.

(d)(ii) A similar number of candidates were able to gain marks on this second part of programming looking for a wait and stop command.

(d)(iii) This part of the question extended thinking further and was looking for a correct use of a feedback loop or return and to understand that outputs need turning on and off. More than 60% of candidates were able to achieve one or more marks and one in three gained the full the marks available.

Question 7

This question is about testing and measuring. The main marks available were for the extended QWC question looking at the methods to test a PCB.

(a) More than half of the candidates gained at least half marks on this question, which was generally well attempted and answered. The quality and legibility of handwriting and poor grammar denied some candidates the top mark available, but over 80% gained at least one mark.

(b) This part of the question asks candidates to identify common test equipment and describe what it is used for. Almost all candidates were able to gain at leat one mark, nearly two thirds achieved half marks, but only 5% of the candidates scored the full four marks available.

(c) For many candidates, understanding the role and purpose of quality control was a difficult concept. Nevertheless, approximately one-third of candidates gained both available marks and a further one-third gained one mark.

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