OCR
RECOGNISING ACHIEVEMENT

GCSE

Design & Technology (Electronic Products)

General Certificate of Secondary Education **GCSE 1953**

General Certificate of Secondary Education (Short Course) **GCSE 1053**

Report on the Components

June 2007

1953/1053/MS/R/07

Oxford Cambridge and RSA Examinations

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General Certificate of Secondary Education (Short Course) Electronic Products (1053)

REPORTS ON THE COMPONENTS

Report on the Components taken in June 2007

Once again the low number of mark adjustments to coursework is commented on by the Principal Moderator. A note of caution should be added though as there is evidence that a few centres are marking right on the allowable tolerance level. All marks awarded must be justifiable by the evidence presented to the moderator; in some cases the evidence has not been as solid as it should be.

In the papers there is a noticeable decline in candidates' knowledge of the basic components and circuits that form the foundation of the subject. Understanding at the basic level will give candidates the confidence to improve the design aspects of coursework and to tackle questions where application of knowledge is required. Presentation of responses in the papers continues to pose a problem; candidates should be encouraged to write clearly and to use correct technical vocabulary whenever possible, only resorting to descriptive terms as a last resort.

On the front of each question paper one of the instructions to candidates is to read each question carefully. It was clear this year that a number of candidates had failed to do this. Candidates should be encouraged to read through and ensure that they understand what is required before starting their response.

Formulae Sheets are no longer published as a separate document.

This did appear to cause concern to a few centres who were expecting separate Formulae Sheets, although it had been stated in the 2006 examination report that they would not be used this year.

Any formulae that are required now appear in the question. This change does seem to have encouraged more candidates to attempt calculation questions and gain marks for at least a part of the question.

It is perhaps worth noting that the themed question in papers 3 and 4 should receive an amount of teaching time commensurate with the marks available for one question. A good approach is to give an initial briefing to the candidates explaining the terms used in the published information sheet and then to use the candidates to carry out research either individually or in groups. A discussion lesson towards the time of the examination will then allow information to be shared.

The individual component reports that follow should be read alongside the question papers and mark schemes.

Internal Assessment

General Comments

It is pleasing to note that for the vast majority of centres, few if any adjustments to marks were required.

The increasing use of ICT continues to add to the presentation of the design folders but many candidates need to consider how they annotate their work, in order to clearly show the relevance of each piece produced. Examples were seen with several pages of computer generated images with no headings or evaluative comments, making it very difficult to see the relevance of the work presented.

A point worth mentioning is that of candidate folder work produced on CD. It is essential that if this work is presented for moderation, computer facilities must be available for the moderator to view the work.

It is important to stress once again that electronics is the essential element in this Specification, a fact which must not be overlooked. A number of candidates spent a lot of time designing enclosures, but failed to offer more than one basic circuit idea.

The implications of this are that they score low marks in both sections three and four as there is little development work done.

The highest attaining candidates were those who had selected their own individual problems to solve and had generated a good range of valid ideas which were then carefully evaluated before a choice was made.

Specific Comments on the Assessment Objectives

Objective 1: Identification of a need or opportunity leading to a design brief

There are still a few centres who allow their candidates to spend too long on this section to the detriment of later work. The identification of possible users of the product would benefit from consideration of: age range, gender, interests, nationality, and ability/disability of the users. The use of digital images, extracts from magazines or papers, or brief statistics to support the need, is to be encouraged. Several candidates who had used the ‘client’ format eg *I have been asked to design…….* failed to explain the problem sufficiently.

Design briefs in most cases were clear, but a number had included specification points.

Objective 2: Research into the design brief that results in a specification

Internet based research was widely used but candidates must evaluate the material in order to gain credit. Simply printing out web pages is a non productive activity.

Survey / questionnaire techniques in many cases remained basic, resulting in information that was not of any great benefit to the candidate. Better examples, in which the questions were carefully framed to discover what the user required from the product, did in fact lead to information that was used to form the specification. It would be beneficial if candidates presented their surveys to potential users of the product which should result in more valid comments compared to the “school based” surveys. Work on existing products in the majority of cases was based on those products found on a website. For many candidates greater benefit would come from examining in detail products or components that have *similar* functions to their intended

product rather than searching for those that are *identical* in function. Eg those including a number display could examine any item with a 7 segment display. This approach would give functional information; the website approach is only likely to give evidence of specifications and manufacturing process for the casing.

Specifications were generally well produced but the stumbling block is still the inclusion of relevant aspects for the, 'System to ensure control over the production of the product in batches'. This needs to refer to a system which would allow standardised products to be produced efficiently. Several instances were found where candidates explained in detail the different levels of production eg job, batch and mass production. This is not required in this section although it is part of the Specification knowledge base.

Objective 3: Generation of design solutions

This is one area where the appropriate use of ICT can make a substantial impact. In the better examples this was certainly the case. The use of CAD packages and the Internet when used effectively are a very powerful tool but candidates must still evaluate each idea against the specification to ensure that the user's needs are catered for. A lack of realistic circuit ideas often coupled to a proliferation of case shapes illustrated the opposite end of the spectrum. We must not lose sight of the fact that this Specification is firmly based upon the Electronics element of the product.

Several instances were seen, particularly where centres had restricted their candidates themes, of generic sheets being used as part of the design work. It would be useful if these were clearly labelled to indicate their source.

Greater use was made of ProDesktop for case designs and whilst this is encouraged care must be taken to show specific detail. How the base would be fitted for example. The use of hand drawn sketches to investigate a range of case ideas prior to ProDesktop development still has its place and should not be overlooked.

Each idea for the circuit and case should be evaluated to determine the suitability. A more objective approach to this would be beneficial, checking to ascertain whether the design fulfils the requirements of the specification.

Decisions on which circuit and case are to be taken forward for development should be clear and supported by relevant information: this still remains an area of weakness.

Communication was varied but in the best examples was excellent, with a wide range of techniques being used.

Objective 4: Product development.

Extensive use of CAD for testing and good photographs of breadboards were seen. From the number of non-working circuits that were seen it would appear that CAD testing alone is not proving to give such accurate information for some candidates, circuit breadboarding may give more reliable results.

When developing circuits and producing the PCB artwork editing facilities offered by CAD could be used more to benefit the candidate. Centres offering PIC based projects should realise that credit is available for evidence of testing during simulation. A print of the screen image or a photograph of the test board would be suitable. A number of projects using PICs failed to explain how the program was developed and tested.

A wide variety of enclosures were seen, from bought in cases modified to suit the purpose to individually designed packages. Whatever approach is taken it is important that the final product

represents as near a professional finish as is possible in the school environment. Some excellent cases were seen; particularly those produced using CAD/CAM facilities. PCBs should be correctly mounted as should batteries and the decisions on all these points should be included within this section. When modifying the case top to add, for example, a row of LEDs or a pattern of holes to let out sound, the use of a jig or template would allow the candidate to consider the implications for quantity manufacture. This is an area which is often overlooked.

Objective 5: Product planning and realisation.

A large proportion of the available marks for this Objective are awarded for planning and there must be evidence for this in the folder otherwise the maximum that may be awarded is 3 marks. More action plans were seen this year including, tools and equipment used, health and safety issues, and quality control.

The most frequent cause of low marks in this section resulted from uncompleted products. It is easy to underestimate how much time the practical work can take but in a 40 hour project we must allow a minimum of 20 hours, which is in line with the total marks available.

At the higher achieving level some excellent projects were seen with little increase in the number of PIC based products. Care must be taken when deciding to adopt a PIC based solution, as instances of inappropriate use can lead to unnecessarily complex solutions, when traditional alternatives would have been more suitable.

A small number of commercial kit based projects were seen and these are to be discouraged as they do not meet the spirit of this Specification which is for the candidates to design and build a marketable electronics product.

When awarding marks for this section, it must be remembered that there must be clear evidence in the quality of the practical outcome to support the assessment made. This remains the area where most moderation adjustments are required, usually as a result of high marks being awarded for uncompleted or low quality work.

Objective 6: Evaluation and testing

The majority of candidates produced reasonable results in this section but uncompleted products proved a problem for some. Even in these cases there were many features which could have been assessed against the specification eg if a PCB had been manufactured the tracks could be tested for continuity. Testing remains subjective in many cases not covering the conditions in which the device was intended to operate. Numeric data collected as a result of testing is required at the higher level. Digital images of testing the final product produced useful evidence. Few candidates had commented upon the performance of the system used to control manufacture.

Presentation

It must be remembered that this section is concerned with the logical and concise nature of the folder and not simply the aesthetics. Separators for each section are to be encouraged as they demonstrate a logical order in the production of the folder.

Papers 1 and 2

General Comments

The papers produced a wide spread of marks with the majority of questions being attempted by candidates in the Foundation Tier; Higher Tier candidates had rather more gaps on their papers with, in some cases complete questions being left unanswered. There were a number of candidates in the Higher Tier who would clearly have benefited from entry to the Foundation Tier. It is worth Centres remembering that the last two questions on this paper are targeted at grades A and A*.

Once again the overlap questions on the papers, targeted at D and C grades respectively covered CAD / CAM and product analysis. There were some good responses to these two questions from both Foundation and Higher Tier, showing that candidates had clear knowledge of the product design process and were able to offer reasoned arguments in their responses. There were also a significant minority, particularly in the Foundation Tier who failed to read the questions properly and consequently lost marks for irrelevant responses.

Legibility of responses continues to cause problems when marking but every effort is made to decipher each response and credit is given wherever possible. There was some evidence this year of candidates trying to give justification for their responses, particularly in relation to cost and speed of production. It is also worth noting that *different* responses will be required for each part of a question; offering the same response for two parts will not normally gain credit for both.

Foundation paper candidates' knowledge of basic techniques was in many cases quite thin. In the question on soldering technique a number of candidates had ignored the given statements to be inserted and had made up their own. The sequence offered in responses rarely started with tinning the soldering iron; however the majority of candidates gained at least one mark for placing two stages in the correct order.

General improvement in the answering of calculation based questions has continued following the decision to print the required formula within the question rather than in a separate Formulae Sheet. Candidates should be reminded that correct substitution into the formula will gain a mark even when the final answer is incorrect. They should also be aware that use of a calculator in this examination is allowed and indeed recommended.

In the Higher paper a printing error in question 3 resulted in the diagram for the 4001B having an incorrect pinout. The marking scheme for this was adjusted to give full credit to either those candidates who had taken the diagram at face value or those who knew the correct version and had answered accordingly.

The question on an amplifier / driver circuit for a relay in the Higher Tier proved difficult for many candidates; the required response was for a transistor amplifier, either a single transistor or a Darlington pair was accepted. A large number of candidates failed to add any components to the drawing and simply connected the IC output to the relay. A minority of responses featured a transistor, thereby gaining a mark, but correct connection of the transistor was rare.

Paper 1 Foundation Tier

1 (a) (i) The opening question resulted in good discrimination between candidates. The microphone being the most frequently identified correctly. There were a surprising number of errors on the LDR. This question was attempted by the vast majority of candidates, most of whom gained marks.

(ii) The NTC thermistor was recognised by most as being the heat sensing component, including those who had identified it incorrectly in the previous part.

(iii) There was a wide variety in response to identification of the cathode in a photodiode. A number referring to length of leg, this reinforces the instruction on the front cover to read each question carefully; the question stated that legs were the same length.

(b) (i) There was a slight majority in favour of the correct choice, the 7/0.2mm multistrand wire.

(ii) A large number of sensible responses that gained the mark. Those that referred to an incorrect choice in the previous part still gained credit for a good reason for their choice.

(iii) The insulating property of the sleeving was widely recognised as was the support to the joint. A few responses correctly noted that colour could be used to identify a wire or that the resulting joint is far neater.

2 (a) (i) Response to this part of the question was mixed. As noted in the introduction there were a number of candidates who had made up their own statements rather than using the given ones. In general the sequence involved in the soldering process was not fully understood.

(ii) The toxic nature of lead was widely recognised but there was some confusion concerning the nature of fumes given off, fumes from flux were cited although it was the fumes from lead oxide which can result in lead poisoning. The majority of responses gained a mark for this question.

(b) (i) A large number of correct responses for the multimeter setting. There were two possible settings to gain the mark, ohms or continuity.

(ii) Those candidates who had completed a circuit gained one mark for this. For the second mark the diode had to be correctly orientated.

(c) The choice of the cutters for trimming legs was invariably correct.

(d) A large number of candidates recognised the permanent nature of soldered joints. Rather fewer noted that screw terminals allow rearrangement of wires in addition to being easily connected. The straight pin connector was the only method not requiring any tools once the connector and pins had been fitted; however in terms of initial fitting it is probably the most time consuming.

3 (a) (i) Answered better than previous calculation questions in the Foundation Tier. Substitution errors were common, particularly forgetting to multiply by the supply voltage. Those who substituted correctly normally completed the arithmetic correctly.

(b) (i) The candidates who used the pin references in describing changes eg *move A16 to A15*, invariably gained marks. There were a lot of very general changes suggested, such as *turn the LED* round or *move the resistor*. This is not clear enough to gain a mark.

(ii) The initials ‘dil’ were not widely recognised and a lot of guesswork ensued. To gain the mark the full ‘dual in line’ was required.

(c) (i) The two relay connections were not well understood. A lot of responses had connections going back to the transistors or the relay coil. Of those who did gain marks rather more had the normally open to motor connection correct.

(ii) The purpose of the Darlington transistor was not well understood.

4 (a) (i) This part of the question discriminated well. Those candidates who had read the question offered sensible answers that invariably gained marks. Different users for each style were expected.

(ii) Understanding on tolerance was generally good with correct answers being common.

(iii) Clear understanding of minus tolerance shown, particularly by those who had the previous part correct.

(b) There were many responses to this part which reflected clear teaching on levels of production. Understanding of the benefits of a CAD generated parts list for ordering was more widely recognised than the stock control / inventory aspect.

(c) (i) Ease of replacement was a widely recognised advantage with the testing of the boards being noted in fewer responses.

(ii) Economic reasons were the most common response for not repairing a board; very few mentioned the difficulty in fault finding on a complex board.

5 (a) (i) The brightness of the LED display was the most common correct reason for its use; rather fewer giving robustness or use in dark conditions.

(ii) There were fewer correct responses for the LCD; although a significant number recognised the lower power requirement when compared to an LED.

(b) (i) The nature of the injection moulding process was well known with many of the benefits for a high level of production being recognised. Where cost is given it is important to justify the response. Saying that the process is 'cheap' is not enough; a better response would be 'it is cost effective when used for high volume production'.

(ii) The property required referred to flexibility in order for the clip to function. As with the previous part, single word answers are not enough. If the correct name for the property is not known candidates can describe the property and gain the mark, eg 'the plastic needs to be bendy to allow the clip to fit into the housing'.

(c) (i) Orientation was the reason for the notch in the key.
Many incorrectly thought that it was to allow the key to be levered out.

(ii) This part produced some very good responses showing clear design thinking. Reduced cost of assembly and reduced time spent in assembly being the most common areas given.

(d) A lot of confusion here as to what is a conductor and what is an insulator. Too many candidates referred to the risk of electric shock being reduced. Better responses referred to reduced wear on contacts and increased reliability of the switches.

Paper 2 Higher Tier

1 (a) (i) The majority of candidates gained marks on this part. A range of potential users of the drawing styles was accepted but different users for each style were expected.
(ii) A high number of correct answers for this part; a few lost the mark by using centimetres as the unit against the answer. Candidates should be reminded that the millimetre is the unit of measurement used in all questions unless stated otherwise.
(iii) Rather fewer candidates gained the mark for understanding the implication of a minus tolerance.
(b) Higher Tier candidates did rather better on this part and many showed a clear understanding of the way that the JIT system / philosophy operates.
(c) (i) Quality control advantages, particularly those related to easy replacement of faulty units were well understood. The implications for testing individual units prior to final assembly were understood by a minority.
(ii) Most responses centred on the cost aspect with replacement boards being more economical than attempts at repair. The actual difficulty of repair and of fault finding with a high density of components was not often mentioned.

2 (a) (i) A spread of answers for this part mainly centred on the range of colours available with LEDs and the brightness in comparison to LCD displays.
(ii) The major benefit of having far lower power consumption was not widely recognised. The range of shapes and different characters that can be produced was the area that gave most marks.
(b) (i) Knowledge of the injection moulding process was widespread. Some confusion on the details of it but the majority gained at least one mark. The question was a good discriminator.
(ii) The property required referred to flexibility in order for the clip to function. As with the previous part, single word answers are not enough. If the correct name for the property is not known candidates can describe the property and gain the mark, eg 'the plastic needs to be bendy to allow the clip to fit into the housing'.
(c) (i) When being assembled the keyboard needs the keys to be correctly orientated, the notch in the key located on a pillar in the casing ensuring each key is correctly located. A common error was candidates stating that the notch was to assist in removal of the key.
(ii) Candidates showed some clear thinking here and a number of suitable reasons for reduction in parts count were given. A few candidates gave the ease of recycling or increased reliability.
(d) A lot of confusion here as to what is a conductor and what is an insulator.
Too many candidates referred to the risk of electric shock being reduced.
Better responses referred to reduced wear on contacts and increased reliability of the switches.

3 (a) (i) Stages in producing an accurate time delay could have included testing against a known time interval; however the majority of marks came from the choice of resistor / capacitor combination.
(ii) Knowledge of PIC devices is more common now than it once was. A significant number of candidates gained the mark for giving a functional advantage of the PIC controller.
(b) (i) Two marks were available for this part, one for the logic level after the input signals were combined and one for the inversion of this result. A far higher number gained the mark for inversion than for the combination of signals.
(ii) As stated in the opening paragraph the pinout diagram was inaccurate. Despite this the majority of candidates who attempted the question gained marks on it. Adjustment to the mark scheme ensured that no candidate was penalised. Any of the available gates could have been used but the majority chose to use the left hand pair

to deal with the initial inputs and the lower right gate for the inversion. In questions of this nature candidates are advised to use the nearest gates to the points that will provide input.

(c) The question required a signal to be amplified to operate a relay. There were few totally correct solutions given to what was simply a single transistor or Darlington driver circuit. Those who inserted a transistor gained a mark. The second mark was for correct connection to the relay and use of a reverse biased diode.
The ULN 2803 Darlington array could have been used for this purpose and would have simplified the circuit diagram; base resistor and diode being integral in the IC.

(d) There were a number of confused responses to this part. Suitable answers would have been double insulation, earthing, or prevention of water from entering the circuit area. Too many candidates were too general in their response and failed to pick out the main dangers.

4 (a) (i) The question was intended to test knowledge of binary notation as well as understanding of the action of a counter. A minority of candidates gained the mark for the output of the 4516B. After 5 pulses it will be indicating 5 on the outputs, ie 0101. Those who had attempted the question and failed to gain a mark frequently had the outputs set to 1010. The outputs for the 4017 go high in sequence; after 5 pulses out 5 is set to high or logic 1 and the remainder to low or logic zero.

(ii) There were a number of responses that could have been offered but the most advantageous is the fact that the IC will count down as well as up. Very few candidates saw this as being an advantage; the fact that it also capable of a higher number count was accepted. The major advantage of the 4017 is in the linear outputs which require no decoding for the user. An alternative reason was the fact that a count up to nine fitted the nine minute requirement of the circuit.

(b) The connection to reset with two different level signals coming from a common source provided good discrimination. A number of candidates gained the mark for connecting the inverter output to the counter IC reset but rather fewer gained the second mark for taking the non-inverted signal to the astable reset. A common error was to short the power supply by connecting the inverter output to both supply rails. This solution gained no marks whereas the inverter output taken to both resets gained a single mark.

(c) More able candidates were able to see that by connecting output 0 confusion could be caused by the user thinking that the first time interval had passed.

(d) The breadboard connections provided good discrimination with most candidates gaining at least one mark from the three. A relatively high number gained all three marks. The two connections to 0V could have been completed by connecting to either of the IC 0V pins; a number of candidates did this.

5 (a) (i) The first mark in this part was for understanding that a diode has a blocking / one way effect. Despite confusion with preventing back emf a good number gained this mark. The second mark was for understanding that the signal was being allowed into more than one PIC input pin. Few correct responses were seen for this second mark.

(ii) This part of the question was looking at the number of combinations available in a 3 input gate or more simply in a 3 bit count. Correct answers were in the minority with many candidates omitting to count the 000 combination.

(b) (i) The PCB layout was well answered. It highlighted those candidates who had practical experience of completing a layout rather than relying on auto routing. The experienced candidates simply connected the points to the nearest correct track; others with less experience routed their track more literally from start point to finish point. Either method if it worked gained the full mark.

(ii) With auto routing software now being so prevalent it was no surprise that the majority of candidates knew the variables that could be applied when converting the circuit.

(c) This part of the question focused on smart materials and a number of good answers appeared to gain the mark. Any application where variable resistance is used as part of a sensor was acceptable. Qualified uses as replacement for other types of switch was also awarded the marks.

(d) The final question on the paper produced some excellent responses though there were a few candidates who dwelt on the toxic effects of lead rather than problems in enforcing the ban on leaded solder.

Papers 3 and 4

General Comments

Handwriting was poor this year and in some cases may have led to candidates losing marks because of illegibility. A further concern was a disappointing lack of subject specific vocabulary evident in many responses, and the inability of some candidates to explain and express themselves clearly.

There were areas where candidates found difficulties on both papers. Once again applying formulae presented problems. Formulae are now given where needed in questions and although candidates are often able to substitute correctly into these, they are too often unable to correctly manipulate unit values to arrive at the correct answer.

Areas of knowledge which it seems many candidates are unfamiliar with include relays, capacitors and logic, the latter proving particularly problematic to many candidates this year. Pre release materials for the Product Design question did not appear to have been researched as well by some centres as in past years.

Paper 3 Foundation Tier

1 Candidates were able to answer most parts of this question successfully.

(a) There was an error on the paper with regard to the correct capacitor symbol for which allowance was made. Even so most candidates were able to score well on this question, with the majority able to get the full marks.

(b) (i) Surprisingly few candidates were able to correctly identify the relay, suggesting that they are not familiar with the device.

(ii) Most candidates gave either ‘contacts’ or ‘switch’ as a correct response. Fewer were able to correctly identify the coil.

A significant number of candidates lost marks because they carelessly reversed the correct responses.

(iii) More than half of candidates were able to select SPDT as the correct switch type from the list.

2 All candidates were able to successfully attempt parts of this question; the correct manipulation of the maths at the end of the question was an obstacle to some.

(a) Although the question clearly stated that candidates were required to place four ticks **and** four crosses, some candidates were unable to grasp this requirement, putting only ticks.

Although most candidates gained some marks on this question few gained the full marks available.

(b) (i) Well answered by the majority of candidates.

(ii) Most answers correctly related to a saving of space, but there were a few that suggested that 'the colour bands could be more easily read'.

(c) (i) Most responses correctly identified the resistor arrangements as parallel and series, although a few were the wrong way round. Some candidates seemed unfamiliar with the correct terminology describing the arrangements as 'side by side' or 'end to end'.

(ii) Many candidates were able to make a correct substitution and gain one mark, but few were able to correctly manipulate the correct units, arriving at an answer of 5A instead of the required 5mA (0.005A).

3 This question caused candidates the greatest difficulties. Few candidates gained any significant marks in any part of the question.

(a) (i) Around half of candidates were able to correctly place the resistor on the stripboard. However it was rare for a candidate to try and locate a track break. And very rare to find one that was correctly located.

(ii) Less than half of candidates were able to identify the 'Darlington Pair'.

(iii) Even where the 'Darlington Pair' was known, few could explain the advantage of using the arrangement to increase gain / make the circuit more sensitive.

(iv) Only the odd response suggested a candidate was aware of 'back emf', and that the function of the diode was to protect the transistors from damage.

(v) Nearly all the responses that attempted to calculate the gain of the 'Darlington' arrangement did so by adding the gain of the two transistors instead of multiplying them.

(b) Many candidates did not even attempt the design of a probe for the rain detector. Those who did produced some very poor results, many failing to show that they understood the principle. Some of those candidates attempting this question seemed not to have noticed that they were required to give details of attachment and suitable materials.

4 Most candidates were able to experience some success with this question and gain marks.

(a) (i) Although the majority of responses suggested a suitable plastic for making the spacers, surprisingly significant numbers of candidates were unable to do so, with 'acrylic' or 'polymer' being the most common incorrect answers.

(ii) Apart from the odd responses of 'iron' or 'gold' nearly all candidates were able to give a suitable metal for manufacturing the spacers.

(iii) The vast majority of responses correctly gave 'injection moulding' as the correct answer. Those that did not tended towards 'vacuum forming'.

(iv) Although many candidates gave 'cost' or 'expensive' as their answer, fewer were able to qualify this to gain the mark.

(b) (i) Nearly all responses correctly identified spacer ‘A’.

(ii) A significant proportion of responses failed to gain the mark because candidates seemed unable to explain the reason for the choice of spacer.
Typical explanations fell short with ‘it is the easiest to use’, without further qualification as to why.

(c) (i) On the whole this part poorly answered with many candidates suggesting either ‘clamping the work down with a G clamp’ or ‘centre punching’. About half the responses correctly identified the need for ‘templates’ or ‘jigs’, although in some cases the devices had to be described because the candidates did not possess the correct vocabulary.

(ii) Many answers correctly related to ‘time consuming’ or the ‘breakage of drills’.

(iii) Most candidates were able to gain one mark for ‘faster’ or ‘quicker’ and some candidates appreciated that multiple holes were produced in one operation. Weaker responses concentrated on the ‘accuracy of hole sizes’, and failed to appreciate that it was the ‘accuracy of location’ that was important.

5 The majority of candidates experienced limited success in answering the question.

(a) (i) Most responses suggested a valid advantage for the use of external power supplies. Many referred to smaller products, greater reliability than batteries, ease of replacement etc.

(ii) Few candidates identified the hazard of cables carrying mains voltages as compared to low voltages.

(b) (i) Less than half of candidates were able to correctly identify the symbol for double insulation.

(ii) The majority of candidates scored well on this part of the question giving a variety of correct responses.

(c) Some candidates were able to gain one mark by showing understanding that voltage remains constant with a regulated power supply. However not many stated that it does so even when load varies, for a second mark.

(d) (i) Few candidates appreciated that a transformer needs to be ‘magnetic’.

(ii) Many candidates identified the ferrite core as the correct transformer type for use in switched mode supplies.

(iii) Almost no candidates showed any understanding of the faster magnetic response times associated with ferrite.

Paper 4 Higher Tier

1 Most candidates were able to experience success with this question and gain most of the available marks.

(a) (i) Although the majority of responses suggested a suitable plastic for making the spacers, surprisingly significant numbers of candidates were unable to do so, with many of these giving 'acrylic' or 'polymer' as their response.

(ii) Apart from the odd responses of 'iron' and 'gold' nearly all candidates were able to give a suitable metal for manufacturing the spacers.

(iii) The vast majority of responses correctly gave 'injection moulding' as the correct answer.

(iv) Few candidates were able to qualify 'cost' or 'expensive' as their answer, to gain the mark.

(b) (i) Nearly all responses correctly identified spacer 'A'.

(ii) A significant proportion of responses failed to gain the mark because candidates seemed unable to explain the reason for the choice of spacer.
Typical explanations fell short with 'it is the easiest to use', without further qualification as to why.

(c) (i) Some candidates suggested either 'clamping the work down with a G clamp' or 'centre punching'. Most responses correctly identified the need for 'templates' or 'jigs'.

(ii) Many answers correctly related to 'time consuming' or the 'breakage of drills'.

(iii) Most candidates were able to gain one mark for 'faster / quicker' and many candidates appreciated that multiple holes were produced in one operation. Some weaker responses concentrated on the 'accuracy of hole sizes', and failed to appreciate that it was the 'accuracy of location' that was important.

2 The majority of candidates experienced some success answering the question.

(a) (i) Most answers suggested a valid advantage for the use of external power supplies. Many referred to smaller products, greater reliability than batteries, ease of replacement etc.

(ii) Few candidates were able to identify the hazard of cables carrying mains voltages as compared to low voltages.

(b) (i) About half of candidates were able to correctly identify the symbol for double insulation.

(ii) Nearly all candidates scored well on this part of the question giving a variety of correct responses.

(c) Some candidates were able to gain one mark by showing understanding that voltage remains constant with a regulated power supply. However not many stated that it does so even when load varies, for a second mark.

(d) (i) About half of candidates appreciated that a transformer needs to be 'magnetic'

(ii) Many candidates identified the ferrite core as the correct transformer type for use in switched mode supplies.

(iii) It was rare for a candidate to show any understanding of the faster magnetic response times associated with ferrite.

3 Candidates showed a disappointing lack of knowledge about capacitors and their application in RC arrangements, with the consequence that few gained more than minimal marks.

(a) (i) Most candidates were able to correctly identify the electrolytic capacitor, although some candidates used the term 'polarised' which was accepted.

(ii) Most answers explained that the electrolytic capacitor needed to be placed correctly orientated within a circuit. A few responses identified the large tolerance as the disadvantage. Most of the incorrect responses related to large size.

(b) (i) From the responses it was clear that few candidates were familiar with the term 'dielectric'. Many responses did specify suitable materials that could be used, and some gave 'insulator' as an answer. However there were many incorrect responses, common ones included 'semi conductor' and a variety of metals.

(ii) Only a few candidates were aware that information about working voltage could be found on a capacitor.

(c) (i) Possibly half of responses correctly substituted in the formula, but many of these failed to appreciate the conversions needed to farads and ohms to calculate the correct answer. Quite a few conversions that were attempted incorrectly converted 2k2 to 2002 ohms.

(ii) Some candidates were able to draw an exponential curve, but few passed through the time constant.

(iii) The discharge waveform was very badly answered, and it was rare to find a response deserving of the mark. Those that appreciated the nature of the curve, failed to gain the mark because they showed the capacitor quickly discharging to 0V.

4 Candidates appeared to find this question the most difficult on the paper, gaining very few marks from their attempts.

(a) (i) Responses regarding forward and reverse biased diodes revealed some poor understanding. Large numbers of responses suggested that 'a forward biased diode makes current flow forwards, whilst a reverse biased diode makes current flow backwards' others talked about 'forward biasing allowing current to flow until the threshold is reached'.

(ii) Few candidates were able to select the correct zener diode value.

(iii) Voltage regulators seemed largely unknown to candidates, with only the rare exceptions able to gain a mark for this question.

(b) (i) The majority of candidates failed to identify the correct fault as two AND gate outputs joined together.

(ii) Few candidates could explain that a high on one AND gate output combined with a low on another AND gate output would result in an indeterminate logic state and possible damage.

(c) (i) Candidates were not familiar with the power supply requirements of CMOS and TTL. Many incorrectly stated that one needed d.c. whilst the other operated on a.c. Others stated that CMOS needed a higher voltage, failing to appreciate that the CMOS could quite as well operate on a lower TTL voltage range. Where candidates identified 'needing less power', they often incorrectly attributed this to the TTL range.

(ii) Few candidates understood 'fan out'. Answers included 'the output for driving a fan', using logic gates to make other logic gates', 'spreading out the logic chips to give them space' etc.

5 Candidates found this question challenging. It highlighted weaknesses in candidates' knowledge about binary numbers and flowchart symbols.

(a) (i) Only a small proportion of candidates correctly gave the answer as 255, with a few giving 256. The majority of answers showed little understanding of binary, with single figure and decimal numbers being common responses.

(ii) Most candidates simply said, 'a dice has only six numbers so the others are not needed'. A few candidates did gain one mark for explaining that filtering would result in the generation of new numbers. It was rare to find any answer appreciating that operational speed played an important role.

(iii) Few candidates were able to correctly identify the flowchart symbol for a decision.

(iv) Almost no candidates were able to suggest the use of a switch and pull up /down resistor at the input to modify the circuit. A few responses did mention a switch at the input to gain one mark.

(b) (i) Less than half responses gained the full two marks for correctly identifying the output states needed to display the number six. Quite a few more responses gained one mark for being aware that either five or six outputs needed to go high, but not able to correctly work out which.

(ii) Very few candidates were able to gain any marks for describing changes that would be needed to sink instead of source an LED display. Incorrect responses included references to 'altering resistor values' and 'using NOT gates'

General Certificate of Secondary Education (D & T) (1053) June 2007
Assessment Series

Component Threshold Marks

Component	Max Mark	A	B	C	D	E	F	G
01	50	-	-	23	19	15	12	9
02	50	25	19	14	8	-	-	-
03	105	82	71	61	49	37	26	15

Syllabus Options
Foundation Tier

Max Mark	A*	A	B	C	D	E	F	G
Overall Threshold Marks	-	-	-	90	70	50	31	12
Percentage in Grade	-	-	-	8.3	33.4	33.3	8.3	16.7
Cumulative Percentage in Grade	-	-	-	8.3	41.7	75.0	83.3	100.0

The total entry for the examination was 12

Higher Tier

Max Mark	A*	A	B	C	D	E	F	G
Overall Threshold Marks	132	115	98	81	60	49	-	-
Percentage in Grade	8.7	30.4	34.8	21.8	4.3	0	-	-
Cumulative Percentage in Grade	8.7	39.1	73.9	95.7	100.0	100.0	-	-

The total entry for the examination was 24

Overall

	A*	A	B	C	D	E	F	G
Percentage in Grade	5.7	20.0	22.9	17.1	14.3	11.4	8.6	0
Cumulative Percentage in Grade	5.7	25.7	48.6	65.7	80.0	91.4	100.0	100.0

The total entry for the examination was 36

General Certificate of Secondary Education (D & T) (1953)
June 2007 Assessment Series

Component Threshold Marks

Component	Max Mark	A	B	C	D	E	F	G
01	50	-	-	23	19	15	12	9
02	50	25	19	14	8	-	-	-
03	50	-	-	24	21	18	15	12
04	50	20	15	11	6	-	-	-
05	105	82	71	61	49	37	26	15

Specification Options

Foundation Tier

	Max Mark	A*	A	B	C	D	E	F	G
Overall Threshold Marks	175	-	-	-	92	76	60	45	30
Percentage in Grade		-	-	-	27.8	26.5	21.0	12.2	7.6
Cumulative Percentage in Grade		-	-	-	27.8	54.3	75.3	87.5	95.1

The total entry for the examination was 1768

Higher Tier

	Max Mark	A*	A	B	C	D	E	F	G
Overall Threshold Marks	175	126	110	94	79	59	49	-	-
Percentage in Grade		11.0	21.4	28.8	23.9	10.8	2.0	-	-
Cumulative Percentage in Grade		11.0	32.4	61.2	85.1	95.9	97.9	-	-

The total entry for the examination was 2269

Overall

	A*	A	B	C	D	E	F	G
Percentage in Grade	6.3	12.3	16.4	25.6	17.5	10.1	5.2	3.3
Cumulative Percentage in Grade	6.3	18.6	35.0	60.6	78.1	88.2	93.4	96.7

The total entry for the examination was 4037

Statistics are correct at the time of publication.

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