OCR
RECOGNISING ACHIEVEMENT

GCSE

Design & Technology (Systems & Control)

General Certificate of Secondary Education **GCSE 1957**

Report on the Components

June 2008

1957/MS/R/08

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This report on the Examination provides information on the performance of candidates which it is hoped will be useful to teachers in their preparation of candidates for future examinations. It is intended to be constructive and informative and to promote better understanding of the syllabus content, of the operation of the scheme of assessment and of the application of assessment criteria.

Reports should be read in conjunction with the published question papers and mark schemes for the Examination.

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CONTENTS

General Certificate of Secondary Education Systems & Control (1957)

REPORTS ON THE COMPONENTS

Chief Examiner's Report

General Comments

As entry numbers are falling slightly, but the quality of the candidates work is not declining. There have been some excellent examples of coursework, with the full range of marks being used. Centres have now learnt to work more efficiently with design folders now fitting the 40 page guidelines. Support for candidates in some centres has been too formally carried out with many pages of research appearing similar.

The entries still show a better response on internal assessment than on the written papers. Once again the lack of the correct use of technical language shows candidates are not retaining the information from taught lessons.
Candidates must expect to use the correct technical terms when describing systems and control processes.

The quality of responses still causes some concern on written papers. Centres must instil in candidates the care needed to complete questions. There is no need to rush the papers since most candidates do complete all sections of the papers in time. Examiners do try to recognise the response and award marks where possible but poor English and illegible writing does not helping the marking process.

Centres need to look in detail at the data at the end of the report to see how the marks for each component make up the final mark and awarding of grades. The awarding meeting spends many hours ensuring the marks on papers and internal assessment give the correctly awarded grades to ensure the the year on year standards are maintained.

1957/01 Paper 1 (Foundation)

General comments

Responses to the Foundation Paper [1957/01] generated a wide range of marks. This demonstrated the paper had offered a good level of differentiation. The vast majority of candidates answered all of the questions which showed that the paper had offered candidates good access to the questions. Too many candidates gave one word answers and in doing so failed to communicate clearly their answer. Centres should remind candidates that credit seldom comes from an unqualified response, especially where the question asks the candidate to give a reason for their answer.

Responses to the Higher Paper [1957/02] produced a good range of candidate's marks and in doing so it demonstrated that this paper had also offered a good level of differentiation. The highest scoring candidates still failed to attain very high marks [55 – 60] However, these candidates lost a small number of marks throughout various questions with no particular pattern. The quality of notes and sketches varied. Too often candidates failed to show detail and accuracy in their sketches, especially in Q5. Centres should note that candidates often find it difficult to communicate responses to all of the design requirements in a question by producing a single sketch. Our advice is for candidates to practice answering past design questions using the method of a single central diagram with linked 'satellite' sketches. Centres should also remind candidates that when a question asks for 'sketches and notes', that there are marks available for both requirements. However good a sketch may be if unaccompanied by any notes then full marks cannot be awarded.

It is important for Centres to remind candidates to respond to the design questions as instructed. Where asked to draw on a Figure they must do so, similarly they should not draw over a Figure when asked to produce sketches and notes in a blank area provided.

The selection of candidates for appropriate tiers was a key element to their performance. Selection was, in the majority of cases, well considered. There was little evidence of candidates being entered for the wrong tier, which improved candidate performance.

Question 1.

(a) The introductory question was answered well, with most candidates achieving 2 marks.

(b) This question was not answered well by a majority of candidates. The sketches needed more care

(c) (i) Many candidates answered this question incorrectly and in doing so demonstrated a lack of knowledge of structures.

(ii) A good number of candidates were able to name a suitable thermoplastic, the most common correct response was acrylic.

(d) Most candidates were able to gain marks here, although again the quality of sketches was often poor.

(e) The majority of candidates gave a correct response. The most common correct response given was 'vacuum forming'.

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(f) The majority of candidates were able to gain marks in this part of the question. The mark scheme allowed a wide range of responses.

Question 2

(a) (i) Answers demonstrated a poor understanding of the terms tension and compression.

(a) (ii) This part of the question was not well answered. Again the accuracy of the sketches was not good.

(b) This part of the question was well answered by a majority of candidates, with many attaining full marks.

(c) Very few candidates demonstrated any knowledge of brazing.

(d) Not well answered, too many responses were not related to 'specification points', which were asked for.

Question 3

(a) A good number of candidates gained marks here, many candidates gained full marks, generally the knowledge of 'block diagrams' was good.

(b) Answered well by most candidates, the most common correct answer was that the resistor limited the current flow.

(c) The majority of candidates gave the correct response which was 'acrylic'.

(d) The correct symbol for a buzzer was not well know.

(e) Answered well by Candidates from Centres who had obviously prepared for this part of the Specification.

(e) Generally the responses were poor, the most common correct response was that the case should be waterproof.

(f) Most candidates were able to gain at least one mark here which demonstrated that the process of vacuum forming had been well taught.

Question 4

(a) The majority of candidates were able to gain a mark here, although a number of candidates failed to gain a mark because they did not label the diagram accurately enough within the +/- 5mm tolerance.

(b) Answered well by a number of candidates. Clearly a number of Centres had prepared well for this part of the Specification, and here candidates applied taught knowledge.

(c) (i) A wide range of appropriate devices to secure the workpiece was offered.

(ii) Answered well by the more able candidates, with the most common correct answers being, 'set the speed', and 'set the feed'.

(d) Answered well by higher attaining candidates who had a knowledge of production processes.

(e) Many candidates did not understand the relationship between the two figures 9a and 9b. The graphic communication skills were not good and many candidates produced sketches with little or no accuracy.

Question 5

(a) Generally answered well by the majority of candidates.

(b) Many candidates produced incorrect answers which involved the use of capacitors.

(c) Most candidates gained at least one mark here.

(d) Many candidates gained at least one mark here, the most common correct response related to the torch being shaped to fit the user's hand. A number of candidates failed to gain marks because they gave details of the use of ergonomics in general terms and did not refer to the torch which was asked for.

(e) Many candidates failed to gain marks because the checks they referred to related to the design stage, rather than the manufacturing stage of production.

(f) (i) Suitable transducers were only offered by more able candidates.
(ii) Many candidates gave a correct response, although too many made general statements relating to environmental issues and were unaware of the meaning of the terms they had used.

1957/02 Paper 2 (Higher)

Question 1

(a) The majority of candidates were able to gain a mark here.

(b) Answered well by a number of candidates. Clearly a number of Centres had prepared well for this part of the Specification, and here candidates applied taught knowledge and a wide range of appropriate answers was given.

(c) (i) A wide range of appropriate devices to secure the workpiece was offered.

(ii) Answered well by the more able candidates, with the most common correct answers being, 'set the speed', and 'set the feed'.

(d) Answered well by candidates.

(e) Many candidates did not understand the relationship between the two figures 9a and 9b. The graphic communication skills were not good and many candidates produced sketches with little or no accuracy. A number failed to appreciate the need for the shaft to be of a smaller diameter than the grab lever to allow the grab lever to pivot freely.

Question 2

(a) Generally answered well by the majority of candidates.

(b) Many candidates produced incorrect answers which involved the use of capacitors.

(c) Most candidates gained at least one mark here.

(d) Many candidates gained at least one mark here, the most common correct response related to the torch being shaped to fit the user's hand. A number of candidates failed to gain marks because they gave details of the use of ergonomics in general terms and did not refer to the torch which was asked for.

(e) Many candidates failed to gain marks because the checks they referred to related to the design stage, rather than the manufacturing stage of production.

(f) (i) Suitable transducers were offered by a good number of candidates.
(ii) Many candidates gave a correct response, although a small number of candidates made general statements relating to environmental issues and were unaware of the meaning of the terms they had used.

Question 3

(a) Answered well, the standard of drawing for the symbols was generally good.

(b) Not well answered, few candidates set out their calculation carefully despite the formula being give, and many did not convert the figures given into the correct units.

(c) Generally answered well.

(d) (i) This question gave good differentiation, the majority of candidates gained one mark but only high performing candidates with a detailed knowledge of electronics gained full marks.

(i) Few candidates gave correct answers, including those who had given a suitably modified circuit in part (d)(i).

Question 4

(a) The answers given showed that the differences between blow moulding and injection moulding were not well understood.

(b) This part of the question was generally well answered. It gave good differentiation with most candidates gaining one or two marks, but only higher performing candidates gaining all the three marks available.

(c) (i) Many candidates lost marks because although they gave good detail in their answers they failed to consider both of the specification points asked for.

(ii) Many candidates failed to address this part of the question in terms of both sketches and notes. Too often the accompanying notes were not given or were very brief and gave no explanation.

(d) Many candidates failed to consider the environment in which the product would be used and offered materials which would easily corrode in water.

Question 5

(a) (i) Many candidates did not consider the information given in the question. Too often they failed to consider the rigidity of the lids and that the material specified was to be a suitable plastic.

(ii) Too many candidates gave little attention to detail especially in the sketches given.

(b) (i) Many candidates gave insufficient gave little detail in their answers to communicate the basic idea of a working mechanical system. Too often the sketches lacked accuracy and any detail showing how the parts could be linked. A number of candidates gave over complex design ideas involving electrical circuits. Many successful candidates answered by using the method of a single central diagram with linked ‘satellite’ sketches giving details of how parts could be linked.

(ii) Many candidates, a number who had produced good answers to part b(i), failed to name the mechanical parts or suitable materials.

1957/03 Paper 3 (Foundation)

Once again the papers produced a wide spread of marks with the majority of questions being attempted by candidates in both tiers. It is important for candidates to recognise that a blank on their paper is a guaranteed zero. As in previous years there were a number of candidates in the Higher tier who would clearly have benefited from entry to the Foundation tier.
General points for candidates to remember are:-

- Read the question carefully
- Attempt all questions
- Do not repeat the question as your response

These points are basic exam technique but in many cases they were ignored.
Responses to the product analysis question appeared to be better than in previous years. In many cases the list of possible answers was quite extensive and allowed for wide thinking by candidates.

Legibility of the responses as usual gave cause for concern. Candidates should be reminded that they can use a ruler particularly in the track routing type of question and if changes are made to a response it should be clearly indicated to the examiner which part they want marked. Calculations continue to be a problem for many candidates. It should be stressed that use of a calculator is allowed and when tackling electronic calculations a calculator should definitely be used. All formulae for the question are now included in the question so the only requirement is the manipulation of the formula. Candidates would also be well advised to look at their answer and see if it is feasible, this would prevent the monostable calculations resulting in answers measured in years rather then seconds.

Knowledge of practical processes appeared to be better this year whilst those topics that would normally be dealt with theoretically were not well known.

Experimenting with simulation software is a good approach particularly for counter ICs as results can clearly be seen on the screen.

There were two minor printing errors on the papers that should be noted by centres intending to use the papers for a mock exam next year. In the overlap question 4a / 1a pads for the mounting pillars appeared in Fig 10 but not in Fig. 2. They should not have appeared in the Foundation paper. The resistor value used in the calculation at the end of question 5 / 2 appeared as 33R in Fig. 17 and 68R in Fig. 9. This made no difference for the candidates but it should be noted that both mark schemes will be required.

1(a) (i) The opening part to the question was generally well answered with the majority of candidates gaining marks on it. Marks were lost mainly due to candidates not knowing the middle word, *emitting*.

(ii) Again well answered with the most popular responses being size and shape as the ways in which LEDs differ.

1(b) Most candidates gained a mark for knowing that a resistor will change the brightness of an LED; rather fewer gained the second mark, confusing reduction in voltage with the correct response of reduction in current.

1(c) Knowledge of correct placement of an LED in a circuit was excellent with few candidates failing to gain the mark... The most common fault with these was not giving a full explanation. E.g. stating that the legs are different lengths. To gain the mark a clear match of short leg to cathode or long leg to anode was required. Very few responses referred to using a multimeter or a breadboard, which were equally valid methods.

1(d) This final part to the question demonstrated that the majority of candidates were comfortable with describing or sketching the practical process that they had used. The main cause of lost marks was failure to mention heating the joint before using a desoldering tool. Colloquial terms such as 'solder sucker' were accepted.

2(a) (i) Placing the terms from the given list into a table was generally well done. Any confusion tended to be with the thermistor and reed switch. Only a small minority failed to gain any marks at all for this part.

(ii) The graphs given of the three sensor outputs presented a problem to many candidates. The response required referred to the shorter time taken for a reed switch to change state, and the increase in time needed for the other two sensors to react. Rather more marks were awarded for a description of the reed switch action than for the LDR and thermistor. Any reference to the reed switch being a digital device was also rewarded.

2(b) (i) The potentiometer in the circuit was frequently recognised but the purpose of it was not stated. Reference to the setting of a threshold voltage or level for switching was required for the mark.

(ii) Very few candidates could describe the effect of a pull up resistor in terms of providing a voltage level when the transistor is switched off.

2(c) (i) The majority of candidates gained at least one of the available marks, for putting the base connection in the correct box. A good number then went on to place the emitter and collector incorrectly,

(ii) The transistor pad was in many cases recognised as a method of preventing the legs form being bent, 'shorting' or being damaged. Rather fewer mentioned the prevention of damage to the pads that the legs are soldered to, which was an equally acceptable answer.

3(a) (i) A surprisingly low number of candidates recognised the given wave form as a square wave. This wave form will have been used by many of them in astable or clock circuits and it is available on many electronics benches as a standard output.

(ii) In this part of the question considerably more candidates gained the mark for recognising the output as an astable signal.

3(b) (i) The most consistently correct timing component was the variable resistor, for the second component very few chose the fixed resistor in series with the variable; instead going for one of the output components.

(ii) The requirement for this part was to mention the working voltage and the polarity of the capacitor; very few candidates got both of these. The question referred to the hazards and precautions taken, a number of responses showed that the candidate had not read or understood this part of the question.

3(c) (i) A number of candidates failed to gain marks for completion of the breadboard connections due to either using a hole twice or confusing the base and collector connections. Candidates should be advised that in this type of question connections should be treated in the same way as either a real breadboard or a computer simulated breadboard when they are completing connections.

(ii) The initials SPDT were quite well known and a majority gained a mark for that part of the response. The 12V, which is the coil voltage, was not well known. Allowing candidates to make use of commercial catalogues can be beneficial in their understanding of component descriptions such as the relay.

4(a) (i) The mark scheme included a range of alternatives for features of the layout that could be changed. Changes to pads and track widths were the most common correct responses. Marks were lost through failure to qualify the response, e.g. mention of a pad without stating that it could be enlarged, reduced or have the hole size modified.

(ii) Those candidates who were familiar with auto-routing were able to give valid stages such as the production of a schematic or choice of board size.

(iii) The majority of candidates who attempted this part gained at least one mark for routing a track. The most common error was in joining the right hand track to the wrong IC pad. There were just a few responses that simply showed a line drawn between the two points that needed joining.

4(b) This part was well answered with most choosing mounting the board in a casing as the possible use of the two pads. Use of the holes for strain relief of the power cables was also an acceptable response.

4(c) (i) The question on the benefits of blocking circuits together was well answered. The majority of candidates understood that the production time would be reduced and that quality would be consistent. This was another example of a question where it was important for candidates to qualify their responses. Those who referred to speed or cost only gained the mark if they went on state how the speed was increased e.g. comparing blocking to individual circuit production.

(ii) Many candidates saw that the scored lines were intended to se used in separation of the boards. The use of a screen printed layer for component information was also widely appreciated.

5(a) (i) In this product analysis question candidates should be advised to look carefully at the evidence before deciding on a production method. In this case there were areas of the novelty siren body that would be impossible to vacuum form; this should lead on to the choice of injection moulding as the most likely method. Ejector pin marks were visible on the underside of the wing and tail; this was an additional clue to the method used.

(ii) Even those who had incorrectly chosen the manufacturing method invariably gained a mark for stating that the colour or type of plastics could easily be changed.

5(b) Many of the responses on the benefits of Chip on Board technology demonstrated clear, logical thought. The most frequent benefit given related to the reduced size of the circuit; this was followed by the reduced danger of damage to the IC during circuit construction.

5(c) (i) This question differentiated well with only the better candidates realising that pressure on the contacts was controlled by the spring.

(ii) A number of almost correct responses were given to the reason for the shaped hole. To gain the mark there needed to be reference to the contact not being able to turn on the shaft.

(d) Those candidates who had read the question were generally able to gain at least one of the marks for this part. The most common mistake was in describing the consumers, rather than the manufacturers, role in reducing environmental damage.

(e) Very few fully correct solutions to the calculation were seen. The first step, reducing the voltage by 1.7V was frequently omitted. The result of the calculation then needed dividing by three for both marks. A number of candidates were unable to change the given formula to allow current to be calculated.

1957/04 Paper 4 (Higher)

1(a) (i) The majority of candidates gained at least one mark on this opening part of the paper. The responses that failed to gain a mark were generally those that altered the basic layout of the circuit; candidates should be reminded to read the question carefully.

(ii) Responses to this part were generally more explicit than found in the Foundation tier. The stages mention often included the software that the candidate had used.

(iii) The question on track routing was well answered with careful drawing of the tracks making marking easier. The most common error was in joining the right hand track to the wrong IC pad. There were a number of papers where the question had not been attempted; candidates should be reminded that this guarantees no mark, whereas an attempted answer has a chance of gaining a mark.

(b) The response most encountered centred on holding the board to the casing; rather fewer suggested strain relief for power cables.

(c) (i) Benefits of blocking circuits for commercial production were well known though one mark was frequently lost for repeating the first benefit with slightly different wording.

(ii) Reasons for both of the features were correctly identified by many candidates. The descriptive level of the responses was, as expected, far better than in the Foundation tier.

2(a) (i) Very few candidates failed to attempt this part of the question and the production method was well known.

(ii) The two accepted responses relating to colour and type of plastic used were chosen by the majority of those who attempted the question.

(b) The level of response was better than encountered in the Foundation tier with fewer candidates resorting to the ‘quicker, ‘cheaper’ style of response, for which no marks were awarded without qualification of the response.

(c) (i) Apart from those who thought that the spring acted in reverse and pushed the contacts apart there was clear thinking shown by many candidates.

(ii) As with the Foundation tier a number of almost correct responses were given to the reason for the shaped hole. To gain the mark there needed to be reference to the contact not being able to turn on the shaft.

(d) The question on avoidance of environmental damage by the manufacturer produced a range of valid responses. Candidates were clearly aware of the biodegradable nature of some plastics. Marks were only awarded for those points that referred to the manufactured aspect.

(e) As with many calculation questions in the past this part was not well answered. A number of candidates gained a mark for calculation of the total current flow; very few had divided this by three to give a result for each LED.

3(a) (i) The question asked for specification points but responses were frequently written as a statement or question e.g. ‘size of circuit’ or ‘speed of sensing’. A number of candidates gained a mark for mentioning the ‘switch on’ temperature for the cooling fan; however the second mark eluded them as they repeated the given point concerning the minimum operating for the fan.

(ii) This part of the question was a good discriminator and those who had thought through the way the system operated spotted the problem with constant switching on and off and its potential effect on the life of the motor.

3(b) (i) Reading and understanding the table was carried out well by the majority of candidates with many gaining both marks. Problem areas included mention of the thermistor resistance at 25°C. As the system operating temperature would be around 100°C this fact would have little bearing on the choice.

(ii) Properties of epoxy resin were generally well appreciated.

(c) The calculation was a standard 555 monostable with the twist that two resistor values had to be added. One marks was awarded to those who had used 480K but got the calculation wrong.

(d) Benefits of PIC based systems were widely known with the accuracy of timing and ability to alter values quickly coming up as the most popular responses.

4(a) (i) This part was well answered with only a small minority not being able to interpret and complete the truth table.

(ii) The function of the AND gate in ensuring that both condition were met before giving a positive output was well answered by most.

(iii) Knowledge of floating inputs was not wide. A number of marks were gained by those who followed the logic through and could see the result of connecting the floating input high.

4(b) Very few candidates had any knowledge of a decoupling capacitor with most completed answers referring to timing and delays. Those who mentioned smoothing were awarded the mark.

4(c) (i) Some good responses to this question were encountered. The ability to check the function of the circuit at a given point was what was required.

(ii) Rather more marks gained for this part than for the previous one. Mention of the visual element was frequent and removal of the need to use a logic probe was also a popular response.

4(d) Marks were awarded for a correct transistor symbol and for valid connections. Those who could draw the symbol correctly generally gained at least one of the marks for connection. The most common fault was in joining the collector to the positive rail as well as to the LED cathodes.

5(a) This question was not well answered. The requirement was for a method of debouncing the signal but a small minority of those who answered chose to clean it with a damp cloth! Methods of debouncing were not clearly explained; the majority of marks gained were for use of a Schmitt trigger, though the full circuit was not shown.

5(b) (i) This question was aimed at A* candidates and it did discriminate well. Knowledge of pin function was not well known or described.

(ii) The 4 bit counter produced more correct responses than the BCD counter. A common error with the BCD counter was in thinking that it reset at 10 rather than 9.

(iii) The purpose of this part of the question was to test whether candidates knew that the maximum count for each IC should be multiplied. For this reason any responses from (ii) that were multiplied gained the mark. Few answers were correct in subtracting 1 from the product i.e. (10 x 16) -1 = 159.

5(c) More candidates described the action of the NOT gate correctly while very few referred to the resets occurring on a low to high transition.

5(d) A good number of candidates realised the shortcomings of reading binary values form LEDs. A few responses were based on use of LCD displays and rather fewer mentioned decoding to a seven segment display.

1957/05 Paper 5 Foundation

General Comments

In general the standard of written responses was the same as in 2007. However, there were some written responses that were very difficult to read, especially Foundation Q3 and Higher Q5. Questions referring to mounting brackets for operating cylinders and the joining of piston rods to operating links, are intended to reflect the activities a candidate should have experienced through their own designing and making lessons. Questions requiring basic mathematical calculations were not well done.

1(a) Sections **A** to **E** were generally well done. Some candidate drawings for **C**, the single acting cylinder, omitted the spring. Some candidates drew an elongated circle for the reservoir but many had omitted to put in the lines for connecting up. Many candidate drew a uni-directional restrictor for **E**

1(b) Only a few candidates described correctly that a reservoir could be used to store air or smooth a supply.

2(a) (i) Many candidates scored the full 2 marks.

2(b) (i) Some candidates drew the symbol correctly. Many responses had the ball and seat the wrong way round.

(ii) Very few completely correct responses were seen that matched the operation of the uni-directional restrictor described in the question.

(iii) Many candidates failed to recognise that a spring would make the arm come down even quicker.

3 This question was generally well answered.

(a) (i) Many candidates recognised that a safety valve was an essential part of an air system

(ii) Most candidates knew what a pressure gauge was.

(b) Many candidates described the pipes flaying around and that air bubbles could get into the blood stream causing a fatality. The system being airtight and not functioning properly were also acceptable answers.

4 This question was generally well answered. Some candidates had difficulty in distinguishing between using CAD to draw and using computers to simulate testing a design for a pneumatic system.

(a) Answers including, able to copy and paste components, easy to draw and save images, make changes quickly and store and retrieve gained the most marks.

(b) Candidates that referred to the testing of the integrity of the circuit, the viability of different components, solving problems through simulation, and cheaper compared with building the circuit for real, gained the most marks.

(c) Many candidates recognised that the change would enable production to run 24/7 with a greater consistency in quality of product. Initial costs would be high but running costs would be lower, a smaller, more skilled workforce and a cleaner working environment also scored marks.

(d) (i) Responses referring to 'magnet' were awarded full marks.

(ii) Some candidates who answered correctly in (i) failed to describe that the reed switch was closed by magnetism, a circuit completed and an electrical signal sent to the computer.

5 Most candidates gained marks for this question. The quality of sketching varied from excellent to very difficult to interpret.

(a) Some candidates did not design for the up and down movement and some did not use the threaded part of the piston rod. A locknut to stop the designed component coming off the threaded piston rod was generally omitted. Most candidates drew a central pin to connect the designed component to the arm. Again, some locking device was needed to stop the pin from falling out. Candidates' who showed a simple 'angle' component that was threaded to accept the piston rod and had a pin to connect it to the arm, scored full marks.

(b) Most candidates drew a solution that was securely fixed to the back of cylinder B. Many candidates did not use the 4 x Ø6 threaded holes to mount their bracket. It was not clear from many drawings how the designed bracket was to be fixed to the mounting lug. Some solutions did not have a suitable locking device to prevent the bracket from coming away from the mounting lug in use.

1957/06 Paper 6 Higher

1 This question was generally well answered. Some candidates had difficulty in distinguishing between using CAD to draw and using computers to simulate testing a design for a pneumatic system.

(a) Answers including, able to copy and paste components, easy to draw and save images, make changes quickly and store and retrieve gained the most marks.

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2 Most candidates gained marks for this question. The quality of sketching varied from excellent to very difficult to interpret.

(a) Some candidates did not design for the up and down movement and some did not use the threaded part of the piston rod. A locknut to stop the designed component coming off the threaded piston rod was generally omitted. Most candidates drew a central pin to connect the designed component to the arm. Again, some locking device was needed to stop the pin from falling out. Candidates' who showed a simple 'angle' component that was threaded to accept the piston rod and had a pin to connect it to the arm, scored full marks.

(b) Most candidates drew a solution that was securely fixed to the back of cylinder B. Many candidates did not use the 4 x Ø6 threaded holes to mount their bracket. It was not clear from many drawings how the designed bracket was to be fixed to the mounting lug. Some solutions did not have a suitable locking device to prevent the bracket from coming away from the mounting lug in use.

3 Many candidates scored high marks on this question. To complete the process chart, a considerable amount of logical thinking was required.

Many candidates managed to complete the process chart with a sequence that would work. The correct sequence is:

1 7 2 5 8 3 1 4 2 6

Some candidates included part of this sequence and scored marks accordingly

4(a) All candidates attempted this question. Unfortunately, many considered the piston rod diameter in the first part of this calculation. This resulted in a wrong answer for the area from the beginning and failed to score any marks. Some candidates used the diameter and not the radius in the area calculation. Candidates', who got the area correct, went on to get the minimum air pressure correct.

4(b) Many candidates gave correct answers that included the effect that the piston rod has on the effective operating area on the 'instroke'

(c) Most candidates understood that increasing the air pressure would solve the problem

5(a) (i) Many candidates named the cushioned double acting cylinder correctly

(ii) Many candidates expressed in their own way the function of the cushioned cylinder and how the trapped air in the chamber at each end of the cylinder slows down the speed of the piston at the end of the stroke. Some candidates thought there was literally a sponge cushion inside the cylinder. A small minority said the cushioning was adjustable or that a small flow control valve was built into the end of the cylinder.

Some candidates stated that using a cushioned cylinder would prevent the robot arm from 'slamming'.

5(b) There were very few good answers to this part of the question, with candidates expressing in their own way what they thought happened with the diaphragm valve in this application. Unfortunately, only a small number of candidates gave the correct response that a small fall in pressure in the supply to the diaphragm valve would result in a signal to the 5/3 valve to send main air through the uni-directional restrictor, blowing off the ball and 'instroking' the double acting cylinder .

1957/07 Paper 7 Foundation

General comments

In general centres had entered candidates in the correct tier this year.

Responses requiring sketching were better this year; however it is disappointing to note that questions where specific technical knowledge is required, revealed a poor understanding in a high proportion of the candidates. It is important that centres give the candidates the opportunity to gain first hand experiences of a wide range of mechanical components and assemblies.

1(a) Many candidates scored the full 3 marks.

1(b) Candidates were required to add eccentric wheels to the axles however many failed to show these mounted in opposing positions and were therefore only awarded one mark.

1(c) (i) Few candidates were able to correctly name the follower.

(ii) Although candidates were generally able to add a component that would lift the the axle many were unable to correctly name the component as a cam.

1(d) (i) Many candidates incorrectly gave acrylic.

(ii) The majority of candidates were able to correctly give injection moulding.

2 (a) Although many candidates were able to give one reason for the use of a bearing few were able to suggest a second reason.

2(b) Very few candidates could give a suitable material for the bearing.

2(c) The most common correct answer given was related to reduction of noise.

2(d) A disappointing number of candidates thought that the rear wheel would increase speed. The majority of correct answers gained only one mark as they failed to explain in detail with reference to the sizes of the pulleys.

2(e) This question reflects experiences that candidates should have had during their designing and making activities, however responses were disappointing with few showing any knowledge of how components can be fitted together.

3(a) Many candidates gained a mark for this question.

3(b) Candidates who were able to show a rigid link appropriately attached to the lever and blade were awarded full marks.

3(c) Approximately half of the candidates were able to correctly name at least one class of lever.

3(d) Few candidates were able to correctly calculate the velocity ratio, many did not even attempt a calculation and as such could only achieve a maximum of half marks.

4 This question tests the candidates knowledge of industrial production and as in previous years reveals a weakness in the coverage of the specification.

(a) Few candidates showed any understanding of ‘just in time’ manufacturing system.

(b) Those who showed some knowledge of J.I.T. were able to suggest a reasonable disadvantage of the system.

(c) Of the candidates who offered an answer to this question the majority were able to suggest a correct example.

(d) Many correct answers to this question reflect candidates own experiences of internet use for ordering products.

(e) Although many candidates clearly demonstrate their awareness of the recycling of products at the end of their useful life few could give detailed enough answers to be awarded two marks.

(f) Many answers failed to address the mechanical system and although gave general answers relating to ergonomics could not be awarded marks.

5(a) The majority of candidates were able to name the worm and wormwheel however few could name the ratchet and pawl.

5(b) The input was well recognised but candidates were less well able to describe the process.

5(c) Few candidates were able to explain the advantage that the worm gives in achieving fine adjustment or locking of the system.

5(c) Candidates’ sketches were generally clear enough for examiners to understand the solutions offered. The majority of candidates were able to gain good marks forthis question by addressing all of the requirements.

1957/08 Paper 8 Higher

1(a) Candidates in the higher tier gave much better responses to this question.

1(b) The majority of candidates were able to give good answers to this question.

1(c) Responses given suggest a good understanding of quality control at this level.

1(d) Answers given reflect candidates' own experiences of internet use for ordering products.

1(e) There were some very good answers to this question with many candidates explaining in detail various recycling symbols or suggesting money back offers.

1(f) Answers revealed a good understanding of ergonomics and there were good examples that related to the mechanical systems.

2(a) The majority of candidates at this level were able to give correct answers to both systems.

2(b) The majority were able to give correct answers to the input with about half being able to describe the process.

2(c) Although many candidates could correctly give an advantage for the worm system over the ratchet and pawl, often they lacked the detail required for two marks.

2(d) There were many very good responses to this question with the majority of candidates gaining at least 3 marks.

3 (a) Although there were some good solutions to this question the majority of candidates gained only 1 or 2 marks because the solutions offered lacked detail that would make the mechanism work.

3(b) Many candidates gained full marks for this question.

3(c) Few candidates scored 2 marks as they failed to explain in detail how the pinch roller moves the paper through the machine.

3(d) This question revealed a general lack of understanding of feedback loops in systems.

4(a) The majority of candidates were able to correctly identify the bevel gear.

4(b) The majority of candidates gained one mark but a good explanation was required for the second mark.

4(c) Very few candidates realised that a variable speed motor reduces the number of mechanical components needed.

4(d) The calculation question was well answered by most candidates.

4(e) Few candidates demonstrated any knowledge of helical gears.

4(f) A disappointingly low number of candidates were able to demonstrate the significance of the viscosity of grease in this system.

5(a) Many candidates were able to give one energy conversion.

5(b) It was encouraging to see many well drawn, good solutions including many muff couplings.

5(c) This was a very disappointing question, few candidates appear to have any knowledge of centrifugal clutches.

1957/9 – Internal Assessment

General Comments
Themes still tend to dominate and there was a tendency, within the theme, for the system of control to be standardised. Examples are of a standardised electronic circuit, using a bought in gear mechanism or making a set of cams which are the same. The resultant designing amounted to having a different output and then packaging the components.
Many centres are using standardised frameworks for designing, which greatly supports low attaining candidates. The more able candidates may suffer giving them little opportunity to be creative in the designing and the layout of their folders.

There seemed to be a lack of sophistication in the coursework projects – some were not for a GCSE examination. In Mechanisms there did seem to be a marked increase in automata, but it was often difficult to identify the input-process-output concept that distinguishes Systems and Control from Resistant Materials.
A few centres are making excellent use of ICT in the presentation of the design folder.

Objective 1: Identification of a need or opportunity leading to a Design Brief
The better candidates carried out initial research in order to identify a situation for designing. It was good to see a number of mood boards being used to illustrate the problem/customer/client.

Most candidates responded to this effectively but there were some very much identical briefs presented.

Objective 2: Research into Design Brief leading to a Specification
Those who identified a real situation for designing were able to carry out effective research into existing products and the needs of the user.

Where actual hands on analysis of existing products was carried out (through disassembly for instance) candidates gained a better insight into the system employed and the construction and assembly of the product, which enabled them to produce more realistic products. An effective product analysis is needed with points identified which can used in the future design activity and be part of the specification.

Questionnaires, in general, were badly constructed and provided little information which would help in the designing of a product. Graphs and charts were the most common methods of presenting data, but the most useful information was gained by client interview.

Data is still not well addressed, candidates do not link the problem to the information which must be collected. For example, the size of hands and fingers to manipulate the product, sizes of required components – batteries, LED displays, motors and gearboxes.

It is important to produce an analysis of the research undertaken leading to the specification.

Specifications tended to be very generic and not identify real need issues that needed to be addressed. Commercial production was only considered as an afterthought for many candidates. Some centres used a formal list: function; performance; size; target market; aesthetics; materials; manufacture; maintenance; reliability; life in service; cost.

Objective 3: Generation of Ideas
In the higher scoring folders this section started with a sheet of rough sketches, putting down all the ideas, then refining for full design sheets containing the clear system and the packaging.

In the main, candidates tended to focus on the packaging of their system rather than designing and developing the system itself. Centres need to remember the packaging is only the casing for the functional part of the design. The system with INPUT, PROCESS, OUTPUT should be clearly identified with choices made for each part.

In some cases electronic circuits and mechanical control showed little sign of being designed at all. When designing the packaging or casing, the shape seemed to be the most important area of focus. Little consideration was given to the layout and fitting of components within or the graphics and necessary labelling on the exterior.

The use of CAD to produce design ideas tended to restrict creativity in designing. Some candidates producing simplistic block drawings at the basic level of Pro-desktop. Communication was variable and it seems that the development of graphic techniques within the course tended to be ignored to the extent that it is now the worst scoring section of the assessment.

Tick box charts tend to be favoured in the evaluation against the design specification, but without reasoned comments or justification there was no logic for the decisions made. Real choice should be made by relating it back to the user/client and need.

Objective 4: Product Development
This section is the most influential in producing a completed working product outcome. The concept of Objective 4 is to be able to hand it to a competent person who should be able to manufacture the product without further reference to the designer. This would not have been possible in some cases which would have resulted in many incomplete and none functioning products.

Some candidates carried out research into materials, components and construction techniques. There were still quite a few who included a lot of ‘text book’ gleaned information which was not totally relevant except to pad out the design folder. It is vital decisions are made on the ’best’ materials, pre-manufactured items and construction methods.

Some candidates integrated modelling, freehand sketching and CAD drawings in developing a final design. Alongside experimentation to test circuits, trial vacuum forming moulds, and even clay models this helped enormously in finalising the chosen design.

Electronics based products tended to be the best and least developed in this section, depending entirely upon the approach of the centre. PIC chips are being seen more often in projects, they are an excellent piece of new technology which make coursework simpler. The flow charts for the control of outputs MUST be shown at different stages to show development. Candidates who show no working are liable to have marks reduced when looking for detail of the final design.

Some good application of CAD packages was evident but there are many who include CAD work because it is felt it should be included.

Control systems for production tended to focus on PCB masks, templates and drawings for CNC milling or laser cutting, alongside vacuum forming moulds/patterns. Opportunities to mention manufacturing in quantity were often missed. The jig/template should be made and used in production.

When looking for the final detail for making the prototype often the most basic information was lacking – working drawings, component lists and cutting lists.

There was evidence of much standardisation here however, where candidates were provided with set circuits and moulds or they could select from one or two made available to them.

Objective 5: Production Planning and Realisation
Continued improvement, making use of Gantt Charts, Spreadsheets and Flow Diagrams. With the exception of the sequence of stages there was evidence of identifying tools and equipment, risk assessment and quality control.

Too many products were incomplete and did not function effectively. Some products were just models and not functioning outcomes which could be applied to the situation for designing. There was still evidence of resistant materials type outcomes, which did not address the issue of a functioning system. For this examination the final prototype show have a clear functioning system. The final construction marks focus clearly on this point.

The section where centres were generally too lenient was in the quality of the final product. Centres tended to over-mark products without using the full range of available marks, typically centres placed the end product in the top box (12-16) when the penultimate box would have been more appropriate. Commonly where mark adjustment has been recommended it is often in this area.

Objective 6: Evaluation and Testing
Candidates must be encouraged to evaluate against their specification which reinforces the importance of the specification in Objective 2. Some sound evaluations were carried out which directly related to the testing of the product. Some feedback and testing was from users.

Very little appraisal was seen of the resources used in making the product. After finishing the whole process the candidates has much detailed knowledge of how to improve all the processes and use of materials. This detail should be recorded with improvements.

Very little comment was made relating to the system for manufacture.

A good number of candidates provided superficial and rather subjective evaluations which were indicative of this objective being addressed at the last minute to meet deadlines.

Presentation
In many centres candidates are being guided in the structure and layout of their folders, using frameworks and prompts as to what should be included. Assessment of this was usually accurate.

Grade Thresholds

General Certificate of Secondary Education
1957 Systems and Control
June 2008 Examination Series

Component Threshold Marks

Component	Max Mark	A	B	C	D	E	F	G
1	50			27	22	18	14	11
2	50	28	23	18	13			
3	50			26	22	18	15	12
4	50	28	22	16	10			
5	50			33	27	22	17	12
6	50	33	27	22	17			
7	50			23	19	15	12	10
8	50	29	24	19	14			
9	100	87	76	65	53	41	29	17

Specification Options

Foundation Tier Electronics

	Max Mark	A*	A	B	C	D	E	F	G
Overall Threshold Marks	175				98	81	65	49	33
Percentage in Grade					19.93	26.45	20.29	18.12	10.15
Cumulative Percentage in Grade					19.93	46.38	66.67	84.78	94.93

The total entry for the examination was 336

Higher Tier Electronics

	Max Mark	A*	A	B	C	D	E	F	G
Overall Threshold Marks	175	140	123	106	89	69	59		
Percentage in Grade		7.52	21.28	26.88	24.16	14.56	2.72		
Cumulative Percentage in Grade		7.52	28.80	55.68	79.84	94.40	97.12		

The total entry for the examination was 663

Foundation Tier Mechanisms

	Max Mark	A*	A	B	C	D	E	F	G
Overall Threshold Marks	175				94	78	62	47	32
Percentage in Grade					16.57	29.72	25.71	14.29	9.71
Cumulative Percentage in Grade					16.57	46.29	72.00	86.29	96.00

The total entry for the examination was 374

Higher Tier Mechanisms

	Max Mark	A*	A	B	C	D	E	F	G
Overall Threshold Marks	175	144	126	108	91	72	62		
Percentage in Grade		6.34	18.01	26.37	24.21	18.30	3.89		
Cumulative Percentage in Grade		6.34	24.35	50.72	74.93	93.21	97.12		

The total entry for the examination was 708

Foundation Tier Pneumatics

	Max Mark	A*	A	B	C	D	E	F	G
Overall Threshold Marks	175				106	87	68	50	32
Percentage in Grade					9.38	25.00	28.13	15.63	15.63
Cumulative Percentage in Grade					9.38	34.38	62.5	78.13	93.75

The total entry for the examination was 33

Higher Tier Pneumatics

	Max Mark	A*	A	B	C	D	E	F	G
Overall Threshold Marks	175	141	125	109	93	73	63		
Percentage in Grade		4.41	14.71	32.35	25.00	20.59	2.94		
Cumulative Percentage in Grade		4.41	19.12	51.47	76.47	97.06	100.0		

The total entry for the examination was 68

Overall

	A*	A	B	C	D	E	F	G
Percentage in Grade	4.60	13.11	18.24	22.10	20.39	9.83	5.13	3.28
Cumulative Percentage in Grade	4.60	17.70	35.94	58.04	78.44	88.26	93.4	96.67

The total entry for the examination was 2182

Statistics are correct at the time of publication.

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