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GCSE

Design & Technology (Systems & Control)

General Certificate of Secondary Education **GCSE 1957**

Report on the Components

June 2010

1957/R/10

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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

The falling entries have refined the type of candidates, with some good work being shown in written papers and internal assessment. In the final year of the specification centres have become very efficient at the preparation of candidates for the examination.

A common theme in all papers is poor writing which makes it difficult for examiners who try to award marks but cannot understand the candidates' response. Similarly the quality of sketching has declined, it would seem that the use of CAD might have reduced this skill.

The use of correct technical language and specific terms for systems and control is in decline.. There is now extensive use of ICT when modelling systems, the result of this is that candidates no longer handle and use components. Problem solving when using breadboards is becoming less prevalent and therefore the experimentation of changing components to refine circuits is understood less.

1957/01 Core (Foundation)

General Comments

Responses to the Foundation Paper [1957/01] generated a good range of marks. This range demonstrated the paper had offered a good level of differentiation.

Responses to the Higher Paper [1957/02] produced a sound range of candidate's marks. Unfortunately no candidates produced very high scores. The higher scoring candidates found no one question too difficult to answer but instead lost a small number of marks throughout the paper. Higher tier candidates did do well on Q5.the design question.

The selection of candidates for appropriate tiers was a key element to their performance. Selection was, in the main well considered. The vast majority of Centres entered candidates for the correct tier. The number of candidates who attained low scores in the range 0-10 on the Higher Paper demonstrated incorrect tier entry.

The ability of candidates to communicate their ideas in the form of clear notes was an improvement on previous years. The size of sketches was important. A good number of candidates produced sketches which were of a large size using the space available, this allowed them to show the detail needed to gain high marks. Candidates who performed well added notes to their sketches when required to do so, which increased access to the marks available to them.

Question 1

(a) This question was well answered. A large number of candidates gained at least one mark. The majority of candidates gave suitable named specific materials, rather than general terms such as 'metal', or 'plastic'.

(b) The majority of the candidates gave the correct terms. A small number of candidates incorrectly transposed the correct terms and gained no marks.

(c) The majority of candidates correctly identified measurements a designer would not need.

(d) The majority of candidates were able to identify a point where a high level of friction was needed, and used accurate label lines to do so.

(e) Many candidates were unable to give a correct response to this question. Too many candidates incorrectly stated 'accuracy' as a reason**.**

Question 2

(a) **(i)** The majority of candidates were able to give a suitable reason for using the counterweight**.**

(ii) Fewer candidates were able to state why the distance of the counterweight from the tower sides could be changed. Many candidates lost marks by simply giving one word answers.

(b) **(i)** The majority of candidates performed well on this question using suitable accurate arrows.

(ii) Many candidates were able to gain one mark, but few gained both marks.

(c) Only a small number of candidates gave the correct answer ‘dowel joint’

(d) A good number of candidates gained full marks on this part of the question, with almost all candidates gaining at least one mark**.**

Question 3

(a) A good number of candidates gained a mark, although many candidates lost marks by referring to safety issues being the reason**.**

(b) Well answered with a majority of candidates gaining full marks.

(c) Well answered with a majority of candidates gaining full marks.

(d) **(i)** Only a small number of candidates were able to offer a correct response. Many candidates misused terms such as ‘voltage’ and ‘current ‘ in convoluted and inaccurate ways.

(ii) A number of candidates appreciated that the component allowed alteration of resistance or current but the explanations were again often convoluted. No candidates correctly referred to biasing of the transistor.

Question 4

(a) Answered well by a small number of candidates, however the majority gave incorrect non-technical answers such as ‘the engine would blow up’.

(b) Few candidates gained marks here. Those who did generally demonstrated good understanding and gained both marks. Many gave general answers which were incorrect such as, ‘keeps the train going at a steady speed’.

(c) The majority of candidates gained marks here. The question showed good differentiation with many gaining one mark, but less gaining both marks. Candidates generally answered in complete sentences, which was pleasing.

(d) Many candidates repeated mistakes of candidates from previous years by simply stating incorrect one word answers such as ‘cheaper, faster or quicker, and as a result gained no marks. Overall a good number of candidates did well and gave correct responses in complete sentences.

(e) **(i)** The majority of candidates gained a mark here. Few candidates demonstrated an understanding of the key issue which is the need to separate the materials.

Question 5

(a) **(i)** A good number of candidates correctly named ‘lathe’ as the CNC machine needed. The majority of incorrect answers were ‘milling machine’, or ‘router’.

(ii) The majority of candidates demonstrated an understanding of the advantage of using CNC machines in batch production**.**

(iii) The majority of candidates appreciated that an advantage was that brass did not rust but many failed to give more detail or relateing the choice to the context of the stud in order to gain both marks.

(b) **(i)** The majority of candidates correctly gave injection moulding as the correct answer. The most common incorrect answer was ‘vacuum forming’.

(ii) Many candidates failed to relate their answer to the product given, a stud, and as a result gave general answers which were incorrect.

(c) This question was generally not well answered which was disappointing as similar questions within different contexts have often appeared in previous years. The control checks needed to be specific and for example needed to relate to specific dimensions. Candidates too often gave non specific checks such as ‘make sure it fits’, or ‘make sure it’s right’.

(d) This question offered good differentiation with many candidates gaining one mark but less gaining full marks. A number of candidates failed to gain marks by simply giving one word answers.

1957/02 Core (Higher)

Question 1

(a) Answered well by a good number of candidates, however many gave incorrect non-technical answers such as 'the engine would blow up'.

(b) The majority of candidates gained marks here. Those who did generally demonstrated good understanding and gained both marks. Many gave general answers which were incorrect such as, 'keeps the train going at a steady speed'.

(c) The majority of candidates gained marks here. The question showed good differentiation with many gaining one mark, but less gaining both marks. Candidates generally answered in complete sentences, which was pleasing.

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(d) This question offered good differentiation with many candidates gaining one mark but less gaining full marks. A number of candidates failed to gain marks by simply giving one word answers.

Question 3

(a) The majority of candidates did well and gained full marks here.

(b) The majority of candidates did well and gained full marks here.

(c) The majority of candidates correctly gave 'transistor' as the answer.

(d) This part of the question was generally well answered with candidates in the main gaining 2 marks or 0.

(e) The majority of candidates performed well on this question. A small number unfortunately lost marks by offering very poor drawings of a buzzer or loudspeaker.

Question 4

(a) This question was well answered by the majority of candidates.

(b) The majority of candidates gave a correct response and generally candidates either gained two marks or zero.

(c) This question was generally well answered with a majority of candidates producing good 3-D sketches.
Incorrect answers generally related to the use of complex gear trains.

(d) This question was well answered and offered good differentiation. The use of feedback was the area in which most candidates lost marks.

Question 5

(a) **(i)** This part of the question was well answered by a good number of candidates. Sketches were in 3-D and showed good detail, and were correctly labelled.

(ii) Again this was generally well answered. Incorrect responses often showed a single axle which would not allow ease of turning for the robot.

(iii) The majority of candidates gained marks here. A common omission was reference to a specific material for the chassis.

(b) Generally well answered by higher attaining candidates. The quality of the sketches and notes was better than in previous years, which was pleasing. A small number of candidates failed to recognise the need to control the two motors independently and as a result gained few marks.

1957/03 Electronics (Foundation)

The examination resulted in a wide spread of marks for both Foundation and Higher Tier candidates.

Once again poor handwriting caused problems for examiners; if the examiner cannot read it no mark can be awarded.

Failure to read the question carefully was a problem with both tiers; in many cases this resulted in the problem being described rather than a solution being given.

The majority of questions were attempted by all candidates in both tiers and fewer single word responses were seen e.g. ‘faster’, ‘cheaper’.

A number of the responses highlighted common weaknesses in basic electronics knowledge; also common sense answers were ignored in favour of those that were too complex. Problems were encountered by many candidates in thinking through a process in logical order and then going on to describe it step by step.

Responses requiring drawing were in general clear, though detailed sketching and annotation is an area where candidates could benefit from regular practice.

Accurate drawing of circuit symbols was a requirement in a number of questions. Question 5 (a) (i) on the Higher paper required an OR gate to be drawn; a significant number of responses were barely distinguishable from AND gates.

The product analysis question, which was one of the overlap questions appearing in both tiers, was generally well answered. The majority of candidates attempted all parts of the question, many bringing in their practical experience to provide suitable responses.

There was evidence that more candidates had used calculators for the questions involving formulae. It is worth noting that correct units should be used for answers and where possible answers should be rounded to two decimal places.

1 (a) (i) This first question on the paper was generally well answered; the majority of candidates knew the features on each component that could be used for orientation.

(ii) The value of the capacitor was the required answer, along with the working voltage of the capacitor. The understanding of working voltage was in some cases not clear, with ‘16 volts’ being given as the answer.

(b) (i) The majority of candidates could place the diode leg correctly in the circuit from the given symbol.

(ii) The result of placing the diode incorrectly should have referred to the blocking or ‘one way’ effect of the diode. This could result in damage to a transistor if the diode were there to prevent reverse EMF. The level of damage mentioned in many responses went far beyond this but the most common response was ‘the circuit will not work’. As the question appeared early in the paper this response was allowed.

(c) Benefits of using an IC holder were generally well known and most candidates gained at least one mark. It should be noted though that this method is no quicker than soldering an IC directly to the board as the same number of joints still have to be soldered.

2 (a) (i) The characteristics of an NTC thermistor in terms of resistance change were not well known and some candidates confused the drop in temperature of the ice with the rise in resistance of the thermistor.

(ii) This question was not well answered; in particular few candidates knew the purpose of a variable resistor in setting the switching temperature or sensitivity of the circuit. Those who gave the reason for using R3 as 'protection' and failed to mention the transistor being protected did not get a mark.

(b) Of the three pin numbers required the output pin was the most frequently identified. Lack of knowledge of how IC pins are numbered was visible on many papers as candidates had incorrectly numbered the pins on the IC outline drawing.

(c) Those candidates who had read the question correctly and stated how the two faults could be corrected generally gained marks. In too many cases the faults were simply described and no marks were given.

(d) (i) The purpose of flux was known and stated by better candidates, very often unclear descriptions were given which could not be rewarded. The word 'protection' was the key to a correct response.

(ii) The majority of candidates knew that lead is the metal no longer used in solders for commercial manufacture.

3 (a) (i) Knowledge of logic gates was not widespread; a small minority recognised the NOR gate.

(ii) Any candidates who gave an incorrect answer for part (i) but completed the truth table to match their answer were awarded a mark.

(iii) Practical application of logic ICs and the need to avoid floating inputs was not a familiar area for most candidates.

(b) To answer this part correctly candidates had to look carefully at the body of the key switch to see that it fitted the shaped hole. Those who did this realised that the body of the switch would rotate if a round hole was used.

(c) (i) Those candidates who matched the 'P' in the formula with the coil power consumption in mW generally gained at least one mark for the calculation. Correct units were not necessary for the marks unless an answer was given with no working.

(ii) Very few candidates seemed familiar with the benefits of a relay. Of those who did gain marks the most popular response was that a higher current can be operated.

(iii) Connections for a diode were known by most candidates, somewhat fewer gained a mark for the Darlington driver connection; extra connections from the transistor collectors were often seen joined to the output contacts of the relay.

4 (a) A well answered question; the majority of candidates identified accuracy as a benefit of using CAD with the second benefit showing a bit more variety. A

relatively high number of candidates incorrectly thought that the use of CAD cuts out human error.

(b) Better candidates were able to give a suitable reason for the use of a tolerance on the mounting holes with some clearly bringing their own practical experience to bear on the response.

(c) (i) A minority of responses referred to measuring the test line for accuracy; others gained the mark through using sensible practical measures such as checking with a component or another template. Measuring the diameter of the holes was not given a mark because of the lack of accuracy that would be obtained.

(ii) A number of candidates failed to read the question carefully and resorted to repeating the question. Those who did note that the comparison was *during use* generally gained marks; very few noted that the acrylic template would guide the drill, rather than just providing a position for the hole.

(iii) The two areas being looked for were alignment of the template and securing it. Clear drawings were seen in response and in many cases good annotation was used. Allowable holding methods ranged from G cramps to double sided tape.

(d) The two symbols being looked for were a recycling symbol and identification of the material type. The majority of candidates gained at least one mark on this question.

5 (a) This question, based on the ergonomic design of the detector, was well answered with most candidates gaining at least one mark. Candidates should be advised that single word responses with no justification will not gain marks, e.g. ‘size’ or ‘shape’ need relating to the hand of the user.

(b) (i) The use of self tapping screws was not understood by many candidates even though they will quite probably have been seen in disassembly work. A pilot hole would be required though it would normally be a part of the moulding.

(ii) Features of the injection moulding process were known by many candidates and the fact that two colours cannot be moulded together gave them the mark. The mark was also given to those who noticed the lack of indentation of the symbols.

(c) (i) This part was generally well answered; most candidates recognised that the glue was securing the wires but a few thought that it was an alternative to soldering.

(ii) The need to keep windings of a coil electrically insulated was not well known. In many cases the enamel was identified as a conductor.

(d) (i) A number of really good sketches were seen in response to this question.
A high proportion of responses used cutting the legs to length as the method of controlling height; others used methods that would have interfered with the soldering of the legs.

(ii) One mark was awarded for noting the faults in the method shown and one mark for a clear advantage of the alternatives offered. Saving on space to reduce the casing size was not an accepted response as the casing and circuit board were already manufactured.

1957/04 Electronics (Higher)

1 (a) A well answered question; showing less reliance on 'accuracy' as a response than was found with Foundation tier candidates. In many case both marks were gained.

(b) Higher tier candidates generally showed more understanding of tolerance on the mounting holes.

(c) (i) A minority of responses referred to measuring the test line for accuracy; other allowable measurements included the distance between mounting holes.

(ii) As with the Foundation tier a number of candidates failed to read the question carefully and missed the words 'in use'. Too many candidates concentrated on the accuracy of the laser cutter rather than the difference in use between the two templates.

(iii) The two areas being looked for were alignment of the template and securing it. Clear drawings were seen in response and in many cases good annotation was used. Better candidates suggested a jig that would do both jobs.

(d) The two symbols being looked for were a recycling symbol and identification of the material type. The majority of candidates gained at least one mark on this question.

2 (a) This question, based on the ergonomic design of the detector, was well answered with a majority of candidates gaining marks. Candidates should be advised that single word responses with no justification will not gain marks, e.g. 'size' or 'shape' need relating to the hand of the user.

(b) (i) The use of self tapping screws was not understood by many candidates even though they will quite probably have been seen in disassembly work. A pilot hole would be required though it would normally be a part of the moulding.

(ii) The injection moulding process was well known to many candidates who stated that two colours cannot be moulded together. The mark was also given to those who noticed the lack of indentation of the symbols or that any symbol placed into the mould would end up inaccurately placed or distorted.

(c) (i) This part was generally well answered; most candidates recognised that the glue was securing the wires but a few thought that it was an alternative to soldering.

(ii) The need to keep windings of a coil electrically insulated was not well known. In many cases the enamel was identified as a conductor.

(d) (i) The use of spacers to achieve a set height gained marks for many. The key factor was that the method should be suitable for batch production; this was frequently missed. Use of measuring devices rather than spacers is not really suitable for a batch of boards.

(ii) Recognition of the damage caused by bending the legs of capacitors was noted in many cases. One mark was awarded for noting the faults in the method shown and one mark for a clear advantage of the alternatives offered.

3 (a) A few very good responses which gained all three marks but many had neglected to insulate the thermistor legs from each other or had chosen a complex solution that did not allow for connecting wires to be attached to the thermistor. The question achieved good differentiation between candidates.

(b) (i) Generally very well answered with the majority of candidates showing knowledge of the comparator.

(ii) Well answered with reduced parts count as the most popular response.

(c) The question indicated that the multi-turn preset required 10 turns to cover the range. Very few candidates saw this as a method of accurate or precise setting of the output voltage.

(d) (i) This question was well answered by more able candidates but there was some difficulty noted in manipulating the formula.

(ii) A mark was given in this question for the correct value of fuse or for the correct value to match an error in the previous part. In many cases part (i) had been correctly calculated but a lower value fuse was then chosen.

4 (a) (i) Despite this style of question having appeared regularly in the examination there were many candidates who seemed unfamiliar with breadboard use. Marks were frequently lost for placing a wire in the same hole as one of the IC pins.

(ii) Only the more able candidates were familiar with contact bounce; lack of accuracy was also given as a problem and gained the mark.

(iii) A high proportion of correct responses were found but a number lost the mark for putting the answer in seconds rather than minutes.

(b) (i) A valid benefit of using a ribbon cable was known to all but a few candidates.

(ii) The majority of candidates correctly answering the previous part gained a mark here for stating that the purpose of the notch was alignment. Most of those responding incorrectly thought that the notch was to help with removal of the plug.

(c) (i) Compared to previous examinations there was a poor response to this question. Those who had experience in PCB design generally gained at least one mark. Errors were made with pin numbers and by not placing pads for the resistor legs to go through. In a number of cases resistors were placed in the space that would be taken by the IC.

(ii) Generally well answered with many candidates showing knowledge of machinery used for commercial manufacture.

5 (a) (i) There were very few correct responses to this question. A connection from the switch to the positive rail was often found but the pull down resistor from ‘X’ to the 0V rail was rarely seen. In many cases additional connections had been made that would render the circuit inoperable.

(ii) A number of responses showing understanding were seen though descriptions were not always clear.

(b) This part was generally well answered; only a small minority demonstrated lack of logic knowledge by using numbers other than ‘1’ and ‘0’.

(c) The mark for completing connections to the buzzer and transistor was awarded more often than the mark for connection of a logic gate. Either an OR gate or an XOR gate could have been used.

(d) This last question was answered very well. A range of valid evaluation points were available and the majority of candidates gained at least one mark.

1957/05 Pneumatics (Foundation)

General Comments

In general the standard of written responses was the same as in 2009. 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 cylinders to operating parts, are intended to reflect the activities a candidate should have experienced through their own designing and making lessons. Connecting a pneumatic system to a computer appears to be a part of the syllabus that is not covered by all students. Questions requiring basic mathematical calculations were not well done by many Higher tier candidates.

1 (a) Sections **A** to **D** were generally well done. Some candidate drawings for **E**, the shuttle valve, omitted one or more of the three ports. Some candidates left out the ball in the shuttle valve.

(b) Most candidates gave a correct response for the purpose of the spring.

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

(b) (i) Many candidates referred to the spring causing the piston to move when air entered the cylinder.

(ii) Most candidates gave a correct answer but many referred to what was happening in the push button valve.

(c) (i) A few candidates gave the correct answer. Many failed to draw a restrictor or the ball and socket in the correct orientation.

(ii) Very few candidates gave the correct answer that the ball and socket in the uni-directional restrictor forced the exhausting air through the restrictor and thus effectively slowed the return of the piston in cylinder B.

3 This question was attempted by all candidates but not always very well answered.

(a) (i) Many candidates explained what a receiver was and what it did.

(ii) Very few candidates explained the full purpose of the safety valve.

(iii) Many candidates stated that it was to drain air and not the excess moisture.

(iv) Only a small number of candidates fully explained the purpose of the regulator. A large number of candidates described the gauge giving an indication of the working pressure.

(b) Candidates got this part of the question either completely correct or completely wrong. It was felt that many candidates used their own explanations rather than the correct technical terms. ‘Pipes flailing’ and ‘safety’ featured among the correct answers.

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

(a) Candidates that referred to the advantages of being able to copy and paste, easier to save drawings, and make changes easily, gained the most marks.

(b) Answers including, can be simulated, integrity of the circuit can be tested, safer testing, quicker as there are no physical connections, cheaper as components are not required, gained the most marks.

(c) Many candidates recognised that a smaller workforce would be needed.

(d) (i) Many candidates did not recognise that the reed switches are activated by a magnetic piston ring inside the cylinder. The diagram clearly showed this as shaded. Responses referring to 'magnet' were awarded full marks.

(ii) Candidates who stated that when the piston moves to the left, the reed switch closes and an electrical signal is then sent to the computer, gained full marks.

5 Most candidates gained marks for this question. The quality of sketching varied from excellent to very difficult to interpret. The responses ranged from attachments that would function correctly to those that did not allow for any movement at all.

(a) Some candidates 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 leg. 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 leg, scored full marks.

(b) Most candidates drew a solution that was securely fixed to the back of the cylinder. Many candidates did not use the 4 x M6 threaded holes to mount their attachment. It was not clear from many drawings how the designed attachment was to be fixed to the Ø10 hole in the mounting lug. Some solutions did not have a suitable locking device to prevent the attachment coming away from the mounting lug in use.

1957/06 Pneumatics (Higher)

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

(a) Candidates that referred to the advantages of being able to copy and paste, easier to save drawings, and make changes easily, gained the most marks.

(b) Answers including, can be simulated, integrity of the circuit can be tested, safer testing, quicker as there are no physical connections, cheaper as components are not required, gained the most marks.

(c) Many candidates recognised that a smaller workforce would be needed.

(d) (i) Many candidates did not recognise that the reed switches are activated by a magnetic piston ring inside the cylinder. The diagram clearly showed this as shaded. Responses referring to 'magnet' were awarded full marks.

(ii) Candidates who stated that when the piston moves to the left, the reed switch closes and an electrical signal is then sent to the computer, gained full marks.

2 Most candidates gained marks for this question. The quality of sketching varied from excellent to very difficult to interpret. The responses ranged from attachments that would function correctly to those that did not allow for any movement at all.

(a) Some candidates 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 leg. 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 leg, scored full marks.

(b) Most candidates drew a solution that was securely fixed to the back of the cylinder. Many candidates did not use the 4 x M6 threaded holes to mount their attachment. It was not clear from many drawings how the designed attachment was to be fixed to the Ø10 hole in the mounting lug. Some solutions did not have a suitable locking device to prevent the attachment coming away from the mounting lug in use.

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

(a) Many candidates managed to explain that the legs must be identical otherwise the device would not 'walk' as one side would be lifted higher than the other and if it did move it would not go in a straight line

(b) A large number of candidates wrote the sequence correctly. Equal number of correct answers had the last two parts as **4, 2** with other as **2 ,4.** Both answers were correct

4 Nearly all candidates attempted this question. Unfortunately, many did not read the question fully. A large number of candidates scored full marks.

(a) A large number of candidates used the Ø10 as **r** (radius) in the calculation. Most candidates used the formula correctly but inserted incorrect data. A large number of candidates failed to put N/mm^2 with their numerical answer to score full marks.

(b) A large number of candidates explained in their own words that the area of the piston was smaller on the instroke because of the piston rod. Therefore, the pressure was not sufficient to move the piston.

(c) Many candidates stated correctly that the solution was to increase the pressure. Some candidates went on to calculate this unnecessarily.

5 (a) This question was attempted by nearly all candidates. Unfortunately very few drew the diaphragm valve correctly or the correct airlines. The largest omission was the restrictor. Without this component the air bleed occlusion would not work.

(b) Many candidates expressed in their own way how the circuit worked. Most did not describe correctly what happened when the air bleed was occluded and what effect this had on the low pressure diaphragm valve. Many candidates stated incorrectly that the air supply to the rest of the circuit came from the air bleed occlusion circuit.

1957/07 Mechanisms (Foundation)

1 (a) (i) The majority of candidates were able to correctly recognise cam C.

(ii) The question describes simple harmonic motion. Cam B would result in a continuous rise and fall but the movement would not be smooth. Cam A would give a smooth rise and fall but not continuous. Candidates giving either Cam B or Cam A were awarded a mark.

(b) There is still a significant proportion of candidates who are unable to recognise the types of motion.

(c) Most candidates were able to suggest a suitable finish.

(d) Many candidates suggested the application of oil which, on wood, would cause the wood to swell and create additional resistance to movement. It is important that candidates are encouraged to read questions carefully.

(e) Candidates were able to give appropriate reasons for the use of both mains and wind power.

2 (a) Although most candidates were able to use the pulley sizes in their calculation many were unable to correctly determine which of the pulleys was the driver and which was the driven.

(b) The most popular correct alternative given was chain and sprocket, however many struggled to think of a second system.

(c) Lower cost and ease of maintenance were the two most popular correct responses.

(d) There were some very good responses to this question that showed a clear understanding of assembly techniques using mechanical systems. However it was disappointing to note the number of candidates who appear not to have experienced this type of activity during their course.

3 (a) Few candidates were able to demonstrate knowledge of torsion.

(b) Although many candidates were able to correctly identify the bevel gear as the most suitable, few were able to adequately explain that a large diameter bevelled gear on the waterwheel shaft, meshing with a small diameter gear on the generator shaft, would increase the speed of the generator whilst turning the drive through 90 degrees. Candidates who incorrectly identified one of the other two mechanisms were still able to gain two marks for part (ii) if they correctly explained how their chosen mechanism worked.

(c) Although many candidates suggested that lubrication was necessary, few went on to explain the reasons for this.

(d) Many candidates were able to give an appropriate finish.

(e) This was another question that demonstrates candidates' lack of awareness of common mechanical engineering fitting practices. Few candidates could show any knowledge of splines, keys or grub screws.

4 (a) Most candidates scored at least one mark, usually, by recognising that aluminium does not rust. However the second most common answer, ‘strong’, was not accepted unless qualified, for example, against the weight of aluminium.

(b) Many candidates failed to gain marks for this question because their answers did not relate specifically to the given scenario. Acceptable responses described modelling of forces, predicted flood levels and relevant data capture.

(c) A disappointing number of candidates were unable to correctly identify the class 3 lever.

(d)(e)Few candidates were able to explain that class 3 levers give a greater range of movement at the expense of lifting capacity.

5 (a) There were some reasonable responses to this question, the majority recognising the capacity of screw threads to give fine adjustment and locking.

(b) Fewer candidates were able to explain the advantage of a square thread over a vee thread.

(c) There was a disappointing number of vague, or guessed applications, or products, that may have a screw in them somewhere. A few candidates correctly suggested car jacks or bench vices.

(d) Although some candidates gave a single answer: ‘rotary’ and a few, ‘linear’. The question asked for the conversion and therefore required both to be given.

(e) Few candidates gave an acceptable answer to this question, failing to address the three specification points. Good answers showed a securely fixed bracket that allowed oscillation of the stay whilst preventing it from rotating.

1957/08 Mechanisms (Higher)

1 (a) Most candidates scored at least one mark, usually, by recognising that aluminium does not rust. However the second most common answer, 'strong', was not accepted unless qualified, for example, against the weight of aluminium.

(b) Many candidates failed to gain marks for this question because their answers did not relate specifically to the given scenario. Acceptable responses described modelling of forces, predicted flood levels and relevant data capture.

(c) A disappointing number of candidates were unable to correctly identify the class 3 lever.

(d)(e)Few candidates were able to explain that class 3 levers give a greater range of movement at the expense of lifting capacity.

2 (a) There were some reasonable responses to this question, the majority recognising the capacity of screw threads to give fine adjustment and locking.

(b) Fewer candidates were able to explain the advantage of a square thread over a vee thread.

(c) There was a disappointing number of vague, or guessed applications, or products, that may have a screw in them somewhere. A few candidates correctly suggested car jacks or bench vices.

(d) Although some candidates gave a single answer: 'rotary' and a few, 'linear'. The question asked for the conversion and therefore required both to be given.

(e) Few candidates gave an acceptable answer to this question, failing to address the three specification points. Good answers showed a securely fixed bracket that allowed oscillation of the stay whilst preventing it from rotating.

3 (a) Many candidates were able to explain that the lever allowed the socket to be adjusted in either direction but few were able to fully explain that it allowed the return movement of the wrench without loosening (or tightening).

(b) There were some very clear drawings showing a thorough understanding of how a ratchet and pawl system works.

(c) Candidates who gave a general reason for lubrication were awarded one mark. Those who addressed the working environment in their answers were given two marks.

(d) Candidates who explained that a lubricant with high viscosity was the most appropriate in this situation were awarded two marks.

4 (a) Many candidates failed to answer the question, attempting instead to describe how to use a 'mole' type wrench. Successful candidates were able to easily demonstrate their understanding of the 'over centre' locking action that is applied in toggle systems.

(b) Candidates who showed a soft jaw were awarded one mark. To be awarded two marks candidates were expected to draw a vee shaped jaw.

(c) (i) The majority of candidates were able to answer this question correctly.
(ii) There were many responses that suggested that candidates have difficulty in translating output and input into driven and driver.

5 (a) This was generally well answered.

(b) There were some very good responses to this question, however many candidates, although able to make a reasonable attempt at the cam based mechanism to move the axe, fewer were able to convincingly draw a mechanism that would oscillate the frog.

1957/09 Internal Assessment

General Comments

Centres are now very comfortable with the specification, with candidates well prepared. There has been an improvement in the quality of the design folders and practical projects. While the use of ICT to enhance and improve the designing and making activity has been on the increase, this year has seen a return to more hand drawn sketches and circuit layouts.

Objective 1: Identification of a need or opportunity leading to a Design Brief

A variety of approaches with some centres restricting the choice of themes, with others allowing free choice of start points. The single sheet has now been refined to include all the points necessary. Batch production has been mentioned less.

Objective 2: Research in Design Brief leading to a Specification

Most folders started with a target tasks sheet detailing the range of the research. The intended purpose of the product is often looked at by using the 5w's.

Existing products analysis continues to be variable, with the lowest level being merely a 'paste up' either using actual pictures or from the web with catalogue pages and no candidate comments. A high level response uses first hand experience of the product using a series of headings looking at function, materials, construction, consumer use, durability, ergonomics and value for money.

When the survey is completed to a high standard there is real information to help later stages. It is pleasing to see most candidates now have conclusions, pulling together the important points from the graphs produced,

The collection of data does not always take place, with the candidates designing products without access to sizes and/or information about anthropometrics.

Summaries that bring together the research information were rarely seen. A series of bullet points would have been useful to focus on the vital points of information.

Specifications are now successfully completed. Most centres have organised a series of headings to help prompt the candidates. A comprehensive list is useful for later use in the evaluation. Commercial production has only a cursory mention.

Objective 3: Generation of Ideas

Most centres now have the systems approach for the start of the ideas. At the high levels candidates analysed the function sections with clear information and comment. There has been a good level of knowledge and experience of using circuits shown in folders. Good use of ICT was seen in electronic systems.

In a number of centres the quality of sketching of the container or structure continues to be poor. Simple pencil drawings with no comments does not show the design thinking. Where candidates are fluent with CAD methods the design was well developed.

The type of design proposals was variable, some centres divorced the system from the container or structure. The more successful were either a combined drawing showing the whole product or when drawing the container all the inputs and outputs were shown and discussed in the added comments.

Selection of the final design is still not completed to a good level. Very few candidates refer back to the need and user when making choices. Tick sheets or a scoring method is seen with adding up points to make the selection.

Objective 4: Product Development

Many candidates gave details of materials, production methods and pre-manufactured items which do not relate to their own project. In many centres, software packages print off lists of materials and components which has little relation to the current project.

On the whole the development of the final design is very well carried out. Modelling, trialling and modifications is an area where centres are very successful.

Details of the final design were sometimes scant and it would be difficult to make the product from the design drawings and information given. At a high level candidates model their system using CAD, PIC Logicator, Croc Clips, ProDesktop, card models and breadboards which leads to effective final details.

Objective 5: Production Planning and Realisation

Almost all candidates now have planning in a number forms but include; stages, tools and machinery, times, QC, and H&S.

During the making activity many centres now use photographs to record the stages, which helps to support the centres mark. Additional recording gave information on snags and problems. This piece of information is useful and often carried out in the centre but rarely seen.

Most centres awarded marks in the 3rd and 4th box but at the higher level this work lacked finesse and quality for the marks to stand. There were certainly more successful working prototypes.

In the middle range candidates making marks showed their interest and ability in constructing projects but scoring less in earlier objectives.

Objective 6: Evaluation and Testing

As more projects were completed successfully the testing could be carried out effectively. Very few tests seem to have included customer or client comments.

Evaluations against the specification were carried out successfully, mainly because specifications have improved. Quite often the same grid was seen with spaces for adding comments.

Presentation

There has been a pleasing move towards powerpoint pages, many of these are setup for candidate responses. Most folders were well ordered with sections clearly marked. Many centres integrated assessment schemes within the folder, giving clear feedback to candidates.

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