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Design & Technology

Systems & Control Technology (1974, 3974)

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Publication code: UG 016446

Summer 2005

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Examiners' Report

Edexcel GCSE
Design & Technology
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GCSE Design and Technology:
Systems & Control Technology Examiners' Reports

GCSE Design and Technology: Systems & Control Technology
Principal Examiner's Report
Unit 1974, Electronics Foundation Tier

General

Candidates were able to answer the technology in society questions much better this year but their knowledge of electronic systems seemed quite poor. They were also able to gain good marks from designing but were poor when it came to evaluating. Candidates were able to gain good marks from the practiced parts of the product analysis question.

The Foundation Paper

This paper tended to perform to expectations with it being aimed at the G to C candidates.

Question 1(a)(i), (ii) and (b) has been practiced well and subsequently candidates have full access to this part of the question. Many candidates scored 8 marks or above for part (a) and most candidates score 2 marks for part (b).
Part (c) was well done by those candidates who were taught gates. Entire centres' entries either gained 3 marks or 0 marks.
Part(d) was well done by all centres.
Most candidates could give at least one reason for prototyping the bicycle alarm in part (e).
A large majority of candidates misread part (f), ignored the "gathering" and gave generic answers for CAD which lost them both marks.

Question 2 (a) (i), (ii), and (iii) were quite familiar to candidates and many secured good marks for these sections. Parts (iv) and (v) demonstrated that many candidates were unaware of the thysistor latch, even though it is the first part of electronic theory in the specification.
Many candidates were unable to determine a resistor's value from the given chart.
When it came to personal stereos, however, many candidates could answer from their own experience. This meant that parts (c), (d) and (f) were well done by many candidates.
For part (e) many candidates gave answers relating to CAD rather than CAM and few managed to gain more than 1 mark in this section.
Many competent candidates could give a reason why manufacturers regularly bring out new models.

Question 3 the design question, Candidates are much better than in previous years at producing different solutions to the criteria given. This is a clear indication of good teaching and candidates becoming clear on the requirements.
It is clear that candidates lack knowledge when trying to evaluate their designs. They either repeat what has been credited in part (a) or they give statements unrelated to the criteria. It is recognised that the intellectual capability to achieve this is quite high.

Question 4 the product analysis question, which is common to both the higher and foundation papers, tended to pose the same problems for both tiers of entry. Whilst less generic answers were given for the torch specification points many of the reasons given merely echoed the points, ie "the batteries must last a long time", for the point and "the driver will not want them to run out" for the reason.
For part (b) many candidates answered that copper was a good conductor of current rather than explaining a reason for its suitability.

Part (c) was well done by both tiers of entry demonstrating that “bought-in components” had been well taught.
Part (d) however, was very poorly completed by most candidates. They tended to give generic answers which could have applied to any thermoplastic process rather than specific answers relating to the cone and vacuum forming.
Part (e)(i) was also poorly completed as they did not give criteria for the torch. Part (ii) was well done perhaps because candidates had practice from previous papers.
Part (f) asked how the torch achieved the set purposes and, whilst the ease of switching on was obvious from the sketch, providing the flashing red warning light needed candidates to read the stem and understand that the timing circuit was instrumental in performing this function. Part (i) was well done, part (ii) was not.

GCSE Design and Technology: Systems & Control Technology
Principal Examiner's Report
Unit 1974, Electronics Higher Tier

This paper's main areas of AO1a and AO1b were very badly completed by the candidature. AO1c and AO3, however, were quite well done.

Question 1 the product analysis question, which is common to both the higher and foundation papers, tended to pose the same problems for both tiers of entry. Whilst less generic answers were given for the torch specification points many of the reasons given merely echoed the points, ie "the batteries must last a long time", for the point and "the driver will not want them to run out" for the reason.
For part (b) candidates did better than their foundation counterparts as they recognised the reasons for the material suitability.
Part (c) was well done by both tiers of entry demonstrating that "bought-in components" had been well taught.
Part (d) however, was very poorly completed by most candidates. They tended to give generic answers which could have applied to any thermoplastic process rather than specific answers relating to the cone and vacuum forming. When candidates referred to the cone they gained good marks.
Part (e)(i) was also poorly completed as they did not give criteria for the torch. Part (ii) was well done perhaps because candidates had practice from previous papers.
Part (f) asked how the torch achieved the set purposes and whilst the ease of switching on was obvious from the sketch, providing the flashing red warning light needed candidates to read the stem and understand that the timing circuit was instrumental in performing this function. Part (i) was well done, part (ii) was not.

Question 2 (a) Candidates from whole centres did not know how to cross couple NOT gates to give a bi-stable although it has its own line in the specification. It was obvious which centres had taught it and which had not.
Most candidates could recognise the truth table for an AND gate in part (b) but the truth table for the gates in combination in part (c) was achieved with a varying degree of success. The candidates who got it right tended to gain all 4 marks with others getting 2 for the first and last lines. 1 mark answers were rare.
Many candidates did not know the reason for using the relay as an interface in part (d).
Most candidates scored 1 mark for the Darlington pair, few scored 2. Many candidates gave the operational amplifier as an incorrect answer.
Most candidates scored well on part (f) describing two methods used to model prototype circuits and giving a reason why they are used.
The answers tended to be generic about CAD & CAM rather than specific, which suggests that many centres have not taught their candidates about CIM.

Question 3 the design question. Part a, the designing task was well done by the majority of candidates. They had practiced designing to a criteria and this was evident in their responses. The least well done element was referring the shape to a process. Candidates are still not good at evaluating their designs and part b was poorly completed by most candidates.

Question 4. Few candidates had knowledge of inverting operational amplifiers. Many candidates scored no marks at all for parts (a), (b), & (c). Many candidates managed to gain 1 of the 2 marks available for part (d) but in part (e) suggested using a microphone, a signal generator or an oscilloscope to listen to an amplified output.

Most marks for question 4 were gained in the A03 sections (f), (g) and (h) which demonstrated that candidates had been taught about built-in obsolescence and that they have personal knowledge of stereo systems.

GCSE Design and Technology: Systems & Control Technology
Principal Examiner's Report
Unit 1974, Mechanisms Foundation Tier

Introduction

The Foundation and Higher papers both produced a wide range of marks and differentiated well. It was pleasing to see that the vast majority of candidates attempted all of the questions and few very low marks were recorded.
Better examination technique could increase the marks of candidates further. Many state answers when asked to explain or describe and gain 1 mark instead of 2.
Mechanical knowledge was generally good and although candidates made progress this year by naming specific materials many had problems in naming a non-ferrous metal.
The design question is an area still requiring attention. Many candidates scored low marks because of poor examination technique rather than for their lack of technical competence. Each design has four specification points each worth 2 marks. Candidates have a tendency to address the first two specification points and neglect the final two. Their second design needs to be sufficiently different from their first in order to gain marks.

Foundation Tier (3F)

Q1
(a) It was clear that candidates had experience of the tools, components and equipment but often they were able to give the 'use' and not the 'name'.
(b) Most understood the concept of input and gave an acceptable answer.
(c) Well answered.
(d) Many confused electro-plating with plastic dip coating and gave 'to insulate' as their answer.
(e) Differentiated well with better candidates scoring both marks.
(f) Well answered, most scoring the first two marks with better candidates adding 'EPOS' for all 3 marks.
(g)(i) 'Cheaper' was the most common incorrect answer. Very few scored 2 marks.
(ii) Few explained one reason. Some stated and gained one mark but many showed little understanding of set-up cost.

Q2
(a) Although a wide range of responses were acceptable many candidates made reference to withstanding high temperatures and failed to score.
(b) Very little understanding of how this could be achieved and this was one part many did not attempt.
(c)(i) Most scored 1 mark but failed to give the ratio for 2 marks.
(ii) Little understanding shown.
(d)(i) Most were able to give one named material with many showing good knowledge of suitable metals and plastics.
(ii) It was surprising that few could give one reason for using a bearing, let alone explain it.

Q2

(e)(i) Both parts poorly answered with candidates not reading the question
(ii) closely enough and not focusing their answers.

(f) Differentiated well with the full range of marks seen. Many stated answers and did not describe.

(g) Again the question was not read carefully enough and most candidates did not focus there answers on the 'effects on the company's workforce'. The most common answers related to the advantages of using CAD/CAM.

Q3

(a) Please see comments made in the introduction. Most candidates made an attempt at both questions but failed to answer all four of the specification points.

(b) This section was answered poorly. Candidates tended to repeat information from their designs and failed to **evaluate** the success (or failure) of their idea in meeting the specification points.

Q4

(a) The question differentiated well with the full range of marks seen.
Candidates should avoid giving one word answers.

(b) Very little understanding of the property hardness was seen.

(c) About equal numbers scored zero and one with few being able to give two valid reasons

(d) Most candidates explained how a screw thread and nut allowed the wheel to be removed to allow work to be carried out on it. Only the better candidates were able to give a second explanation.

(e)(i) Well answered.
(ii) Few were able to describe mechanical quality control checks.

(f)(i) Both parts were well answered with candidates able to analyse the bike
(ii) and explain how the specification points were satisfied.

GCSE Design and Technology: Systems & Control Technology
Principal Examiner's Report
Unit 1974, Mechanisms Higher Tier

Higher Tier (3H)

Q1 on Higher Tier is the same as Q4 on Foundation. Please see Q4 above.

Q2
(a) Very well answered. Candidates have obviously received good safety training.
(b)(i) Virtually all named two metals but a number named pure metals instead of alloys.
(ii) Many failed to explain one reason for alloying metals.
(c)(i) A wide range of imaginative answers were seen with about one half of
(ii) candidates explaining valid reasons.
(d) Poorly completed answers were not focused on 'quality control by simulating mechanical processes'.
(e) Again poorly answered. Candidates did not read the question closely enough and did not relate their answers to gathering information.
(f) (i) and (iii) were not answered well.
(g) Many stated their answers to gain one mark but failed to explain in order to gain both marks.

Q3
(a) It was pleasing to see the first two specification points answered so well. Very good application of technical understanding was shown relating to drive mechanisms. Specification three, relating to temporary fixings, was less well answered and few made reference to materials and processes in order to access the final two marks.
(b) The majority of candidates evaluated their ideas and scored well but even at this level a number persist in repeating information instead of evaluating and gain no credit for doing so.

Q4
(a) Many gained one mark for stating 'gear train' with about one-third scoring fully by prefixing 'compound'. Complex gear train was a common answer.
(b) In all three stages many candidates stated instead of describing what happened and lost three marks as a result.
(c)(i) Candidates either understood the operation of a ratchet and pawl and scored two or had little knowledge and failed to score.
(ii) Few were able to name a non-ferrous metal. Of those who did aluminium was a common but unacceptable choice.
(d)(i) Candidates need to read questions in more depth before answering. Few referenced their answers to the benefit to the **consumer**.
(ii) Again the question was misread by many. Few made full reference to 'culture'. Those who did gave some very good answers.
(iii) Some good answers were seen but again many were not focused. Another common fault was to give variations on a theme relating only to environmental factors.

GCSE Design and Technology: Systems & Control Technology
Principal Moderator's Report
Unit 1974, Coursework

Centres who have now gained a few years experience of this examination are providing coursework projects that demonstrate a sound understanding of the specification requirements. In particular, design and development of electronic circuitry is often of a demanding nature and many candidates have recognised how the building blocks of a system can be effectively organised. Many have gone on to develop fully functioning products that meet the rigours required at the higher levels of KS4.

It was apparent, where most centres candidates performed well, that a good range of topics have been considered. However, where some centres gave a pre-prescribed task, many candidates found it difficult to demonstrate 'real ownership', showing their contribution to the project development. There is a need, when setting tasks, to recognise that each candidate should be able to respond fully to each section of the specification.

Where candidates are now able to make use of computer software to develop systems, this should be encouraged. It is important though, to recognise a need to demonstrate an understanding of the processes performed at the designing stage. In some cases, where a candidate had simply presented screen shots of various aspects of a circuit, there was often insufficient evidence to support the high mark often wrongly awarded.

The growing use of computer software has provided support for the design and development of electronic systems and this has led to a very high level of presentation. Where used, and where candidates can still track and demonstrate an understanding of the processing of each stage, there has been a marked improvement to many outcomes.

Centres that offer projects based on the mechanisms specification have unfortunately often fallen short of the requirements associated with the higher level of award. Quite often, many have focused on only low levels of rather simplistic mechanical processes. Some work that was otherwise extremely well presented, was often let down by the use of a single or rather basic mechanism. This did not allow the candidate to offer sufficient evidence to support a depth of understanding, which extended beyond the lower levels of the specification requirements.

In a few centres there is still a tendency to spend an in-proportionate amount of time developing the housing for circuitry. Some centres do need to recognise the need to balance the time spent on each section of development, taking account of where the marks are awarded.

The majority of centres submitted coursework folders as recommended on A3 paper with a maximum of 20 pages. Conforming to this format enabled the moderation process to be undertaken with the required degree of consistency. Where some centres still submit excessive amounts of padding or badly spaced work, the moderation process can become extremely frustrating. Where teachers had annotated work to coincide with clearly numbered pages it supported the moderator in finding and agreeing the given mark.

GCSE Design and Technology: Systems & Control Technology
Principal Examiner's Report
Unit 3974, Electronics Foundation Tier

General

It is difficult to generalise as so few candidates undertook the examinations.

The product analysis question, **which is common to both the higher and foundation papers**, tended to pose the same problems for both tiers of entry. Whilst less generic answers were given for the torch specification points many of the reasons given merely echoed the points, ie "the batteries must last a long time", for the point and "the driver will not want them to run out" for the reason.
For part (b) some candidates answered that copper was a good conductor of current rather than explaining a reason for its suitability.
Part (c) was well done by both tiers of entry demonstrating that bought-in components had been well taught.
Part (d) however, was very poorly completed by all candidates. They tended to give generic answers which could have applied to any thermoplastic process rather than specific answers relating to the cone and vacuum forming.
Part (e)(i) was also poorly completed as they did not give criteria for the torch. Part (ii) was well done, perhaps because candidates had practice from previous papers.
Part (f) asked how the torch achieved the set purposes and whilst the ease of switching on was obvious from the sketch, providing the flashing red warning light needed candidates to read the stem and understand that the timing circuit was instrumental in performing this function. Part (i) was well done, part (ii) was not.

The Foundation Paper

This paper tended to perform to expectations with it being aimed at the G to C candidates.

Question 1(a)(i), (ii) and (b) has been practiced well and subsequently candidates have full access to this part of the question. Many candidates scored 5 marks or above for part (a) and most candidates score 2 marks for part (b).
Part (c) was well done as they had been taught gates.

Question 2 (a) (i), (ii), and (iii) were quite familiar to candidates and many secured good marks for these sections. Parts (iv) and (v) clearly demonstrated that candidates were unaware about the thysistor latch, even though it is the first part of electronic theory in the specification.
A few candidates were unable to determine a resistor's value from the given chart.

GCSE Design and Technology: Systems & Control Technology
Principal Examiner's Report
Unit 3974, Electronics Higher Tier

This paper's main areas of AO1a and AO1b were poorly completed by the candidature.

Question 2 (a) Candidates could not cross couple the NOT gates to make a bi-stable, although they could recognise the truth table for an AND gate in part (b) but the truth table for the gates in combination, in part (c) was achieved with a varying degree of success. The candidates who got it right tended to gain all 4 marks with others getting 2 for the first and last lines. Some candidates did not know the reason for using the relay as an interface in part (d).
Most candidates scored 1 mark for the Darlington pair, few scored 2. Many candidates gave the operational amplifier as an incorrect answer.

Question 4. The number of candidates who had knowledge of inverting operational amplifiers was few. Many candidates scored no marks at all for parts (a), (b), & (c). Some candidates managed to gain 1 of the 2 marks available for part (d). and all gained the mark for the output device.

GCSE Design and Technology: Systems & Control Technology
Principal Examiner's Report
Unit 3974, Mechanisms Foundation Tier

There was only one candidate entered for this paper. Please see relevant comments on the full course report for future guidance.

GCSE Design and Technology: Systems & Control Technology
Principal Examiner's Report
Unit 3974, Mechanisms Higher Tier

The paper differentiated well with marks covering the range expected for a higher paper. Candidates generally did well on questions 1 and 2 but there was a lack of technical understanding and terminology in question 3.

Q1

(a) Generally well answered but some candidates gave one word specification points such as 'brakes' and did not gain a mark. They were not penalised if they went on to give a meaningful reason.
(b) Very few associated hardness with the ability to withstand wear, scratching or indentation.
(c) Some good answers with most candidates scoring at least 1 mark.
(d) Most correctly explained that a screw thread and nut could be easily taken apart. Very few scored more than 2 marks. Answers such as 'strong' are not awarded of a mark.
(e) (i) Two parts identified correctly by most.
(ii) Few candidates made reference to mechanical quality control tests.
(f) (i) & (ii) Well answered by most.

Q2

(a) Three safety precautions listed by most.
(b) (i) Almost all scored at least 1 mark but many name metals such as copper and tin.
(ii) Candidates knew a reason for alloying but most stated instead of explaining.
(c) (i)&(ii) Generally well answered.

Q3

(a) Very poorly answered. Virtually no understanding was shown that this was even a gear train.
(b) (i)(ii)(iii) Most scored 1 mark in each section but again they stated answers instead of describing them.
(c) (i) About one half described the operation well and scored 2 marks. The rest showed little or no understanding.
(ii)Very few candidates named a non-ferrous metal. Of those who did their choice tended to be inappropriate eg copper. Steel was the most common answer.

GCSE Design and Technology: Systems & Control Technology
Principal Moderator's Report
Unit 3974, Coursework

General comments

There was evidence that centres had been generous in there marking with projects that did not fully meet the rigours associated with KS4.

While centres provided clear and accurate annotation providing direction to where marks had been awarded it was not always possible to credit the high marks awarded. This was mainly due to where:

- some teachers had rewarded a candidate using the same evidence for two areas of study.
- teacher observation was used to justify marks without sufficient evidence to support the level of mark applied. Teacher observation alone was not considered appropriate in some areas of assessment.
- some entries circuit development did not exceed the KS3 level of demand
- candidates often failed to recognise how the Specification should be used to drive each stage of the design and make process.

GCSE Design & Technology: Systems & Control Technology
(Full Course: 1974)

Grade Boundaries – Summer 2005

Overall Grades – Electronics

The figures given below are the minimum subject marks required for each overall grade in the summer 2005 examinations.

(Foundation Tier out of 100)

C	D	E	F	G
53	42	32	22	12

(Higher Tier out of 100)

A*	A	B	C	D	E
79	68	57	47	36	30

Overall Grades - Mechanisms

The figures given below are the minimum subject marks required for each overall grade in the summer 2005 examinations.

(Foundation Tier out of 100)

C	D	E	F	G
51	41	31	22	13

(Higher Tier out of 100)

A*	A	B	C	D	E
82	71	60	50	41	36

Component Marks

The figures given below are the minimum marks required for each component grade in the summer 2005 examination.

(Coursework 01 out of 102)

A*	A	B	C	D	E	F	G
92	80	68	56	45	34	23	12

(Paper 2F out of 88)

C	D	E	F	G
47	38	29	20	11

(Paper 2H out of 88)

A*	A	B	C	D	E
56	48	40	32	22	17

(Paper 3F out of 88)

C	D	E	F	G
44	35	27	19	11

(Paper 3H out of 88)

A*	A	B	C	D	E
60	52	44	37	31	28

GCSE Design & Technology: Systems & Control Technology
(Short Course: 3974)

Grade Boundaries – Summer 2005

Overall Grades – Electronics

The figures given below are the minimum subject marks required for each overall grade in the summer 2005 examinations.

(Foundation Tier out of 100)

C	D	E	F	G
53	42	31	21	11

(Higher Tier out of 100)

A*	A	B	C	D	E
76	66	56	46	36	31

Overall Grades - Mechanisms

The figures given below are the minimum subject marks required for each overall grade in the summer 2005 examinations.

(Foundation Tier out of 100)

C	D	E	F	G
50	40	31	22	13

(Higher Tier out of 100)

A*	A	B	C	D	E
81	70	59	49	40	35

Component Marks

The figures given below are the minimum marks required for each component grade in the summer 2005 examination.

(Coursework 01 out of 84)

A*	A	B	C	D	E	F	G
76	66	56	46	37	28	19	10

(Paper 2F out of 44)

C	D	E	F	G
23	18	13	9	5

(Paper 2H out of 44)

A*	A	B	C	D	E
27	23	19	15	10	7

(Paper 3F out of 44)

C	D	E	F	G
21	17	13	9	5

(Paper 3H out of 44)

A*	A	B	C	D	E
29	25	21	18	15	13

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