AQA

ASSESSMENT and
QUALIFICATIONS
ALLIANCE

General Certificate of Secondary Education

Design and Technology (Systems and Control Technology) 3546/C

3546/C   Coursework

Report on the Examination

2008 examination - June series

General Comments

This year has proved to be successful for this specification in terms of the majority of centres assessing the design component accurately, rewarding candidates with the grades they deserved. Once again the overall standard of outcomes improved slightly with centres in general encouraging candidates to produce work at an appropriate level of demand for this specification.

Many centres should be congratulated for an excellent display of Systems and Control work where their candidates had successfully linked Core and Focus technologies in their coursework. Visiting moderators reported that they were made welcome by centres which had usually gone to some length to provide a suitable location with the work laid out well for inspection. It is very helpful when centres remove the backs from cases or open them for moderators to gain access to internal mechanisms and electronics, provide batteries or power packs and, when appropriate, a compressed air supply; this helps the moderation process enormously.

General Administration

The moderation time period is narrow, and although the moderation process was relatively trouble free, there are a number of areas which need attention.

- Centres are reminded that Centre Mark Sheets need to be with AQA and the moderator no later than the 5th May.
- **Centres with twenty or fewer candidates should include all coursework folders when sending the Centre Mark Sheets to the moderator**
- Centres need to complete and send to the moderator a Centre Declaration   Sheet.
- Each candidate requires a completed Candidate Record Form attached to the design folder with grades for each assessment stage. Appropriate annotation is also helpful.
- Candidate design folders should be individually fastened together in a logical order to assist the moderation process.
- **Bulky ring binders should not be sent to the moderator.**
- Care needs to be taken by centres when using the assessment matrix.
- Where two or more teachers are involved in teaching Systems and Control Technology, internal standardisation must take place.
- **Centres are asked that they make a prompt response to moderators' requests.**
- Centres should be reminded that the moderation procedure is completely confidential and the moderator is **not** permitted to offer verbal feedback during their visit. This is particularly important given that moderators are not in a position to know whether or not any adjustment will be made to centre marks at a later date. Written feedback will be available when results are formally announced.

Assessment

Most schools were sufficiently accurate in their marking and the moderator was able to confirm the centre's assessments. Many centres referred to the autumn meeting photo sheets to aid the accuracy of their assessments. Where assessments were inaccurate, they tended to be lenient rather than harsh.

Moderators are looking at a sample of design folders from centres to determine whether centres are marking at the standard set by AQA. They check designing grades against the standard by looking at the folders, and check making grades awarded by looking at the photographs provided by centres. It is therefore important that these photographs do show sufficient detail of the finished product/system to allow moderators to make accurate judgments regarding grades awarded, therefore photographs should show detail of any internal mechanisms and electronics.

Annotation

The Candidate Record Forms provide essential information to moderators. Breaking down the overall designing and making grades allows moderators to see how centres had arrived at their assessment. Commentary to illustrate these grades is also very helpful. The provision of *photographs of outcomes* provided by most centres is a great help to the moderation process and should show detail of any internal mechanisms and electronics.

Coursework - Design Briefs
- The advertising theme continues to be the most common theme used by centres, although where centres had used other briefs some exciting work was seen.

- Moderators feel the majority of teachers are comfortable with the moderation process. Many centres are marking quite generously but within tolerance and folders are becoming more focused with well-made functioning products as the outcome. Problems can arise in centres where there are staffing issues.

- There are a number of centres only offering one design brief to the candidates. In some cases the brief is sufficiently open to give scope for a wide range of challenging outcomes to be designed and made, **but in others there is a distinct lack of individual creativity because the teacher has led from start to finish.**

Designing skills

- Candidates should ensure they cover the full design process and satisfy the AQA assessment criteria as stated in the specification.

- Candidates should evaluate their work at many stages throughout the project and not just at the conclusion of the project.

- Centres need to use the AQA Candidate Record Form to give feedback to the candidates on the progress of their designing and making skills.

Design Folders

Research

For higher grades in this section candidates should *'Use a wide variety of appropriate sources to gather relevant research information'.*

- Research is becoming much more focused and relevant to the task although a few centre's still use the *more is best* approach, **filling folders with copious amounts of irrelevant research material**.

- Candidates need to be taught how to decide about what to research, how to research, how to summarise research, how to cut down on the time given to research and how to include prior knowledge rather than carrying out a research activity for which they already have the information.

- Candidates should be encouraged to collect a range of relevant research material, make reference to books, data sheets, and component catalogues that they have used. Carry out practical research in the form of testing circuit ideas, using kits, breadboards and computer simulation.

- There are still a number of questionnaires completed; these often take three or more pages to show the results. Superficial comments from friends often produced worthless data. Carrying out public surveys at this early stage is only worthwhile if they establish something that the candidate does not already know, in many cases they are completed on mass by the candidate themselves. It is better to spend the time on more worthwhile activities that feed into the design process.

Analysis of task and research material

For higher grades in this section candidates should '*Analyse the task and the research material logically, thoroughly and effectively'.*

- The vast majority of candidates effectively analyse the task.
- Research material is still often described rather than analysed. The simple question 'How is this relevant to my work and what can I learn from this?' applied to all research material would have aided many candidates.
- Candidates should be encouraged to break down the problem into a number of smaller problems or sub-systems:

  - analyse the research material and the electronic and mechanical/pneumatic elements of the problem;
  - use a systems approach and identify possible input, process and output devices;
  - use a variety of diagrams and charts, possibly supported by experimentation and, if need be, market research. The experimentation can be carried out with the use of kits or with the help of computer aided design.

Specification

For higher grades in this section candidates should *'Produced a detailed specification, which focuses closely on the analysis'.*

- The better candidates discuss the function of the system, the constraints of cost, size and time, the working parameters of input, process and output components/devices, and make reference to power sources. It is pleasing to report that many centres had directed candidates to cover general areas such as:

    - Target market
    - Function
    - Size
    - Weight
    - Durability
    - Aesthetics
    - Materials
    - Safety
    - Cost
    - Green issues
    - Manufacture

- A good specification is crucial to the success of any Systems and Control project and it will make it easier for the candidate to carry out the formative and summative evaluation.

- The specification could be re-written or added to later in the folder as the candidate proceeds with designing the system.

Generation of Ideas

For higher grades in this section candidates should *'Produce a wide range of distinct proposals, which satisfy the specification'.*

- Moderators look for a variety of systems initially in the form of '*system diagrams'* that consider alternative forms of technology. AQA must stress that the design and development of the system is fundamental to Systems and Control Technology and should be simply and clearly evidenced within the folder.

- At this stage in designing, candidates should be encouraged to apply mathematical calculations and record this evidence in their design folder.

- Centres need to ensure that candidates use and apply the given formulae in the specification wherever possible in their coursework.

- Candidates should sketch or draw out by any means several designs e.g. three circuit ideas, alternative mechanical ideas or pneumatic ideas and show how the system may be assembled to its final outcome, these ideas may be relatively simple and appropriate to house the system at this stage. This type of activity may give the candidate the chance to carry out experiments using kits, software packages and breadboards to test their theories. The use of photography in a candidate's design folder enhances the folder and is an excellent record of experimental work carried out with kits and breadboards.

Development of Solution

For higher grades in this section candidates should '*Use one or more of their proposals and relevant knowledge of techniques, manufacturing and working characteristics to develop a detailed and coherent design solution.'*

- Once again, far too few candidates are undertaking any real development of their ideas and simply redrawing one of their initial ideas as a design proposal. Moderators reported that many candidates simply moved from ideas into a making plan.

- Many candidates did not provide enough detail for third party manufacture to be attempted.

- Candidates should give reasons why they have selected a certain circuit or system from their generation of ideas and, equally, give reasons why they have rejected the other systems.

- Candidates intending to manufacture their own circuits should present an accurate final circuit drawing which satisfies the specification and clearly takes into account relevant research and analysis. The circuit diagram should contain sufficient information for the circuit to be made by a competent third person.

- Candidates who intend to use a printed circuit boards should show the developmental stages of their PCB layout or transparent overlay. This type of activity gives candidates of all abilities the opportunity to involve themselves in design and to show what they know and can do.

- This method of working contrasts greatly to the trend of many candidates who find a single circuit and use it without considering whether or not it can be improved upon.

- Development work on PIC programming, and mechanisms was missing from the folders of many candidates. However, some good combinations of control and mechanisms or pneumatics with resistant materials were seen in the work of higher level candidates.

Peripheral Interface Controllers (PICS)

- If a PIC is chosen as the most suitable building block for the process section, it should be arrived at by way of investigation.
- The candidate should explain the development of the control program for the PIC.

Planning of Making

For higher grades in this section candidates should *'Produced a correct sequence of activities, which shows where, why and how practical production decisions were made.'*

- Greater use of flow charts was made by many candidates this year and this relates well to industrial practices. More able candidates were able to indicate the quality assurance/quality control checks that would take place at various points and the action that would be taken.

- The use of diaries to record the stages of the making was seen in an increasing number of centres this year. Candidates must be aware that in addition to the diary they must provide full evidence of planning to attain the higher marks. Full credit was given to planning as long as there was sufficient evidence to support the judgment that planning had taken place.

- Excellent use was made of the digital camera for recording development work as well as testing.

- Some of the more able candidates presented design proposals in sufficient detail that a separate planning document was not required. Credit was given when it was obvious that some planning had taken place.

- In some cases there was little evidence in the folder to support the modification and working errors criteria and the moderation process relied on teacher annotation. More able candidates had undertaken some testing as an integral part of the development before commencing the final product and had clear evidence of modifications.

- Candidates of all abilities are planning and making manufacturing decisions throughout their coursework, yet very little of this is ever recorded. If candidates can record these decisions in a manufacturing diary then this should be encouraged. **Decisions are made by candidates of all abilities but records are often omitted even by more able candidates**

Evaluation, Testing and Modification

For higher grades in this section candidates should have '*Tested, objectively evaluated and effectively modified their work throughout the process as appropriate.*'

- It was reported that some centres were not allowing sufficient time for evaluation, testing and modifications to be made and carried out. This part of the design process is poorly attempted by a significant number of candidates and is partly due to candidates completing their projects very close to the 5th May AQA deadline date.

- Centres must ensure that their candidates have sufficient time to complete this important section. They should encourage candidates to think up interesting ways of testing their projects and the record the results, using block diagrams, pie charts, pictograms, etc. The use of photography can be encouraged to record testing and to highlight any suggested modifications to the system.

- This section of the assessment criteria is possibly the only place in the design folder that a candidate can carry out an extended piece of writing and gives candidates the opportunity to reflect upon the whole process.

Use of Communication, graphical and ICT skills

For higher grades in this section candidates should have **'*Selected and skilfully used a wide range of communication, graphical and ICT skills, which have helped to clarify their thinking and are sufficient to convey ideas to themselves and others effectively and precisely*'**.

- Throughout their design folders, candidates should be encouraged to show a wide range of communication skills and techniques. They should use information technology and appropriate software packages to generate circuit diagrams, printed circuit board overlays, the simulation of circuits on screen, and, if used, PIC programming.

- Teachers should remember that candidates should be rewarded for communicating their thinking in an appropriate way.

Social Issues, Industrial Practices and Systems and Control (including the use of CAD)

For higher grades in this section candidates should have '*provided evidence that they have considered and taken into account relevant issues, industrial practices and systems and control.*'

- Many candidates had approached this as a bolt on section at the end of the folder, and some copied material on general issues related to production was again seen in the folders of some candidates. This is unnecessary as there is plenty of opportunity throughout the various sections of the folder to demonstrate these issues effectively.

- Systems and Control of course should be evident throughout any folder in this specification. Many candidates achieving the higher grades had taken the opportunity to demonstrate how their system had been manufactured and which industrial practices had been utilised.

- Many candidates achieving the higher grades had taken into account the impact their design might have on society. Where centres had addressed this aspect, candidates showed a good understanding throughout their work.

Making

It should be noted that a small number of candidates achieved low grades as a result of not completing a project which was too difficult for them to attempt or not fully suitable for a Systems and Control specification. Centres should endeavour to match the project specification to the ability/skills of the candidate and the Systems and Control specification.

- If candidates choose to make and populate their own PCB boards, their circuit build quality can be improved by securing flying leads to the PCB with strain holes thus adding a mechanical joint to assist the soldered joint.

- Input and output devices such as Switches and Light Emitting Diodes should be well insulated with bare wires sleeved to reduce the possibility of short circuiting.

- The PCB and battery should be held securely within the system with easy access to allow changing the battery.

- It is advantageous to the candidate to be able to complete a project and see it working. Many candidates do achieve success with PICs and evidence all assessment criteria but centres must ensure that candidates:

    - provide evidence of PIC programming
    - provide a range of design ideas
    - evidence sufficient making skills in other areas of their realisation if using a commercially made bought-in PCB.

Correction of working errors

- Using diaries to record the stages of making has proved to be useful when moderators are looking at work as the moderation of this process often relies on teacher annotation.

Use of appropriate equipment and processes (including the use of CAM)

- More able candidates produced some very good work. Where CAM was available this undoubtedly has a positive impact on the work seen in the majority of centres.

- Production diaries are useful in the assessment of this area in pointing out what equipment and processes have been used. It should be stressed that where CAM is used candidates do need to record all aspects of this work with ***screen dumps*** and notes in their folders and centres need to be clear that making grades can only be awarded to the candidate's own making.

- Whilst many candidates require considerable assistance centres do need to be vigilant about monitoring this work and recording assistance on the Candidate Record Form.

Production and effectiveness of outcome

- Electronic and/or mechanical or pneumatic products are expected to function to access the higher grades, although moderators when visiting will be sympathetic to a project with the capability of working that may not work effectively on the day of the visit.

Level of accuracy and finish

- Generally, this has continued a year on year improvement as fewer candidates take on inappropriate projects; however some centres do not allow sufficient time for final system assembly.

Use of Quality Assurance (QA) and Quality Control (QC)

- Production diaries are useful in the assessment of this area and it is also evidenced by candidates making their own functioning PCB boards and/or mechanical or pneumatic inputs or outputs. It is important to emphasise that this is part of the making assessment and is not regarded as a section within the design folder.

Advice to Centres

Centres need to choose their design briefs carefully, and if they are unsure discuss them with their coursework adviser. If the centre is offering only one design brief to candidates make sure the brief is sufficiently open to give scope for a wide range of challenging outcomes to be designed and made. It is worth considering the following points when starting coursework projects.

- Ensure candidates start a suitable task. It should include scope for them to show their ability and use systems and control technology.

- Start projects early to allow candidates sufficient time for testing and evaluation.

- Match students to project titles that they can achieve within 40 hours.

- Encourage candidates to highlight where decisions are made in the folders and explain why they made them.

- Use the assessment criteria and marking scheme with candidates, to show how they can improve their grade.

- Encourage candidates to keep the research relevant to the project. It may include looking at how other products work and an interview with a potential user. This should also include an analysis, explaining their results.

- Encourage candidates to write a clear and concise brief. This can be two or three sentences. The specification should be as detailed as possible, including measurable statements (e.g. "the final product must be no larger than *100mm* x *50mm* x *15mm*, so it will fit in the user's pocket").

- Ensure candidates record each stage of the project's development and modification. They should keep all their rough work and should not see the folder as an exercise in graphical presentation techniques.

- Set candidates intermediate deadlines for each stage of the project. The making section frequently takes longer than expected and has weighting of two thirds. For candidates to achieve high marks their project needs to be completed. This will also mean they will be able to carry out a detailed evaluation, which could include returning to the person they interviewed as part of their research.

- Introduce the concept of industrial practice as soon as possible in the course and discuss with candidates how this could form an integrated part of their coursework.

Encourage candidates to use ICT which is relevant to Design and Technology. It is preferable for candidates to show in depth skills in a small range of software, rather than a shallow overview of a larger range of software. A good working drawing using CAD or circuit/system design and development are better examples of ICT skills.