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Moderators' Report/ Principal Moderator Feedback

Summer 2015

Pearson Edexcel GCE in Engineering
Unit 6933_01
Principles of Design, Planning and Prototyping

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Summer 2015
Publications Code UA040782

6933 Report 2015

Principles of Design, Planning and Prototyping

General comments

For this unit: Principals of design, Planning and Prototyping, students are required to produce a single design and make task using titles from those published by Edexcel, or by generating their own. They must produce evidence of a solution to their selected problem in a design folder, of engineering drawings, technical specification writing, designing and developing a solution to the selected task, planning for production, manufacturing and giving an oral presentation to peers. A design folder must be submitted for moderation, which must include photographic evidence of what has been manufactured.

As is always the case, this year saw a mixture of high quality work and that which was unimpressive and not of AS standard. Almost all work submitted for moderation was potentially appropriate to the requirements of this unit and offered students access to the full range of marks available; there were hardly any inappropriate tasks such as those that would have been better placed in RMT courses.

Although a wide range of coursework projects were undertaken, Edexcel's approved titles such as PCB holder, mini-drill holder and can-crusher were ever popular. Where electronic type tasks were taken on, there was a propensity to ignore the requirement to produce alternative ideas, and students often used 'found' circuits that were not fully understood. In such cases, the level of challenge was low, limiting opportunities to score higher marks in the design section.

Quite a few projects included the use of mechanisms, but the range of alternatives explored to produce linear motion from rotary motion or reciprocating/oscillating motion was limited when this would have been a fertile area of graphical exploration and design development.

In a minority of cases students were allowed to over-use CNC machines and other CAM equipment such as laser cutters and 3D printers, which limited opportunities to demonstrate a range of other high level making skills.

Marks awarded by centre assessors were generally close to Edexcel's standards, but in some cases, especially in criterion (c), marking was lenient where the evidence presented did not match the credit given.

Assessment criterion (a)

Last year this report highlighted the use of automatically generated engineering drawings from 3D CAD sketches and warned against this procedure. However, this year has seen a greater increase in this practice and as a consequence fewer high band marks were agreed. In this assessment criterion it is expected that students will produce engineering drawings either by hand, or through the use of a 2D CAD drawing package to enable formal drawing skills to be developed and to give students an understanding of what an engineering drawing is. Simply pressing a computer key to generate orthographic views from a 3D CAD sketch develops no understanding of layout or drawing conventions and standards. There are eight marks to award in this section, but they cannot be gained where drawings are generated automatically.

Assessment criterion (b)

As has been the case in previous years, this section was done very well by most students where the requirements for planning for production were well understood. The vast majority of students were able to present an appropriate sequence of manufacturing tasks, which included projected times and deadlines. A minority of students recorded units of time in days, weeks or lessons, without qualifying how long these units of time were. A few students presented Gantt charts which considered the whole design and make task, instead of focusing in detail on product manufacture only; and a minimal number wrote planning statements retrospectively, describing what had been done rather than what was planned to be done. The best work seen in this section detailed tasks and sub-tasks and gave projected timings in hours and/or minutes. It is not expected that students should be able to predict accurately how long a task will take, but they should be aware that some processes and tasks will take longer than others to carry out.

The quality of specification writing varied considerably. Better examples of specifications contained statements that were technical, measurable and justified; statements that could be used to check ongoing designs against and to evaluate the final practical outcome. Unfortunately, a lot of specification statements were superficial, vague and non-specific, and lacked technical information that could have been used as testing and evaluation tools. User requirements and Performance requirements are

important sub-sections of a product specification, as this is where technical and measurable statements are made, but on many occasions these areas were more or less ignored.

Assessment criterion (c)

Once again this year, this assessment section was not well addressed by the majority of students. Some very high quality, detailed work was seen, but this was a rarity. Although students generated ideas, these were often limited in detail of sub-systems. It is not enough to annotate a sketch to point out that a component part adjusts, swivels or slides; students should demonstrate graphically how such design features might be achieved.

Many students failed to present alternative designs, or they included simplistic sketches that were no more than body-styling exercises presented to meet an assessment requirement. Few designs were linked to specification points or research, and annotation often revealed a lack of understanding of materials and processes. In a lot of cases it could be seen that students had already decided on their final design idea and other design ideas presented were superficial and lacking in development.

Development of designs was generally weak, and students failed to illustrate how initial designs had been refined and developed into a final design proposal. There was often little or no evaluation of the final proposed design to check its viability or fitness for purpose.

There was an increase of electronic design ideas presented, but it was rare to see alternative circuit designs being considered. Many students used ‘found’ circuits without making any attempt at development or modification. It is not expected that students will design circuits from first principles; what they should do is assemble established electronic building blocks in creative ways to explore alternative ways of producing the desired performance for their intended product.

Assessment criterion (d)

Most practical work was complete and functioning and some very high quality outcomes were presented, demonstrating a range of challenging processes and high level skills. However, some students were over-rewarded for poor quality work that was of low demand. A small minority of products, despite being well made, scored low marks because they were simplistic and did not meet the expected levels of response for this course.

Most marks awarded by centre assessors were agreed, but sometimes high marks were awarded where there was an over-reliance on CAM. In order to achieve high marks students must demonstrate high-level manufacturing skills, attention to detail and precision in their work, which cannot be done if their skills input is limited to the simple assembly of component parts that have been manufactured by computer controlled machinery. Whilst it is important to embrace new technologies, the use of CAM equipment should be limited to no more than 50% during product manufacture.

Where electronic project work was submitted for moderation, there was often little evidence of the quality of making linked to the electronic circuitry. Credit can be gained for evidence of soldering neatly, dealing with flying leads, anchoring circuit boards inside cases, etc., which are all creditworthy activities.

The quality of photographic evidence presented by some centres remains problematic. The practical outcome is worth one third of the marks available, so it is essential that clear and detailed photographic evidence of manufacturing and processes used is supplied, otherwise no marks can be awarded in this assessment section. Marks cannot be awarded for witness statements without explicit photographic evidence.

Despite submitting photographic images of practical work, a significant number lacked the detail necessary to illustrate the complexity of task and the higher-order skills necessary to gain higher marks. A series of photographs taken over a period of time during manufacture is the ideal way of highlighting processes used and providing examples of precision and attention to detail that may not be readily noticeable in an image of the finished product.

Assessment criterion (e)

In this section marks are generally accepted based on teacher witness statements and the provision of some form of evidence of student presentations, such as photographs or hard copies of presentation slides. A few students provided little or no evidence of having carried out a presentation, and in some cases high marks awarded were suspect, particularly where the rest of a student's folder was of limited quality. In such cases, marks were not fully accepted.

Administration

Administration tasks were generally well carried out and accurate. A few teacher assessors failed to include annotation or page numbers to guide the moderator to assessment evidence, and a minimal number of addition errors were discovered.

A few teacher assessors included annotation to say that they could not find marks sheet templates to use when recording marks; these can be found in appendix D for 6933 and appendix G for 6936 of the Teacher Guide for this course, which can be found under the heading ‘Coursework Materials’ on Edexcel’s A level Engineering webpage.

Grade Boundaries

Grade boundaries for this, and all other papers, can be found on the website on this link:
http://www.edexcel.com/iwantto/Pages/grade-boundaries.aspx

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