



Level 3 Technical Level **DESIGN ENGINEERING: MECHATRONIC ENGINEERING**

Unit 2 Mechanical Systems
Report on the Examination

H/507/6524
June 2018

Version: 1.0

General Comments

The assignment brief performed as expected. Most students demonstrated at least a basic understanding of the unit's content. The most successful students tackled the assignment in an orderly and pragmatic way.

To achieve a pass, all of the criteria for pass must be appropriately evidenced; to achieve a merit, all of the criteria for pass and merit must be appropriately evidenced; and to achieve a distinction, all of the criteria for pass, merit and distinction must be appropriately evidenced.

A significant proportion of students had indicated within their portfolios where the individual assessment criteria have been addressed; for example, by listing the relevant criteria number in the title. This is recommended as best practice.

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Grading Criteria	Commentary
P1 Describe four different examples of mechanical systems, each of which transmits motion or force between different forms of motion.	This criterion was very well answered by this cohort of students, their examples included: gears, levers, piston and crank mechanisms etc. Many included images – best practice.
P2 For a given design specification, design a mechanical system to meet the desired outcomes.	A good selection of designs was used for this presentation. Video evidence was used by several centres – good practice.
P3 Outline all design considerations.	This criterion was well-answered with some sound engineering terminology used.
P4 Specify the components to be used in the mechanical system in order to meet a specified performance.	This cohort of learners appear quite knowledgeable of available components and their use. As in the last presentation, many of the students presented their findings in tabular form – best practice.
P5 Select an appropriate electric motor to power the mechanical system.	This cohort of learners included appropriate choices for motors in their designs. An image would always help here – best practice.
P6 Produce a general assembly diagram of your design, showing the mechanical components.	There were some excellent examples of general assemblies produced. Good use of hand drawn assemblies proved popular among this group of learners. There were some very good CAD presentations in this series also.
P7 Produce a production plan for your product that provides the correct sequence of operations and use of tools.	Some good production plans were inserted that were well-presented and accurate. The best ones were produced in tabular form.

P8 Provide a risk assessment for the assembly process, identifying hazards, risks and control measures.	The best risk assessments were the ones produced for the actual manufacture of the particular project by the students.
P9 Carry out assembly operations to the appropriate standards and tolerances, including the correct use of relevant materials, equipment, tools, or products.	Many of this cohort produced photographic evidence here, which detailed the students' involvement with the assembly process. Great use of today's technology as a means of evidence gathering. P9 generally well-answered.
P10 Work safely at all times, complying with health and safety and other relevant legislation, regulations, guidelines and local rules or procedures.	Again, good use of photographic evidence, detailing use of: safety glasses, overalls, machine guards etc. Some of the centres presented witness statements, for their students, written by their tutors, that fully corroborated the students' engagement with activities P9 and P10 – very good practice that should be adopted by all centres.
P11 Select and use appropriate measurement methods to test the mechanical elements of the constructed system and record the results of the test in an appropriate format.	Many students used a personally designed test record sheets as acceptable evidence – best practice.
P12 Create a preventative maintenance schedule for a mechanical system.	P12 was very well-answered across this group of learners. Some good evidence was produced with realistic dates timings and was presented in tabular form – best practice.
M1 For two different examples of mechanical systems, explain how the system changes the magnitude of the force or movement of the input.	The best answers included the action of gears with explanations of increasing torque and / or changing speed. Many students included images in their explanations, c / w captions, explaining what the images represented – best practice.
M2 Explain the way in which the mechanical components within your mechanical system operate to provide the required outcome.	Good answers gave detailed descriptions of components and how the torque could be increased. Some students provided sound calculations of gear ratios and input / output speeds – best practice.
M3 Identify those that are relevant to the design.	Here, the best project portfolios took the relevant design considerations and linked them to their own design and explained why they were their preferred choice.
M4 Explain why the chosen mechanical components are suitable for the application.	Good use of engineering terminology was key to the best responses here. For example, low density, corrosion resistance, ease of manufacture, strength, durability, ease of assembly etc. A well-answered section.
M5 Justify the choice of electric motor for the assembled mechanical system.	A high proportion of the students answered this criterion well. Their explanations and presentations considered the requirements of

	their particular design (e.g. function, rpm, torque, cost, efficiency), in comparison to the other types of motor listed in the specification.
M6 Suggest improvements or modifications that could be made to the mechanical system you have constructed.	An engineering analysis was required here. For example, during the first trial use of their design, many of the students took readings / timings to use in a future analysis. Much of this data was used to help formulate a plan to improve a particular design – best practice as noted last year.
M7 Justify the use of the selected measurement methods.	Many of this cohort handled this criterion well. Video and photographic evidence was used in many cases to evidence this and justify their selection.
D1 For a mechanical system, justify the choice of mechanical systems used in the design, in terms of their operational capability.	The justification should be based around sound engineering principles, practice and methods. For example, the strength of the gripping mechanism used to grab the load or the use of a motor strong enough to climb a step etc.
D2 Justify the choice of three of the chosen components and identify possible alternatives.	Justification should include comparisons of various components. A catalogue of advantages and disadvantages for the components would be a suitable method. A table of advantages / disadvantages is good practice and simple to evidence.
D3 Evaluate the mechanical system you have constructed, covering how well the system meets the given specification and how testing supported any improvements made.	A good account of the trial and testing methods, of the students' devices, was in evidence here. Again, many of this cohort used video and photo evidence to present their findings as in previous presentations of this unit.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the [Results Statistics](#) page of the AQA Website.

Converting Marks into UMS marks

Convert raw marks into Uniform Mark Scale (UMS) marks by using the link below.

[UMS conversion calculator](#)