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Tech-level Engineering
Foundation Engineering
Mechatronic Engineering

Unit 2 Mechanical Systems
Report on the Examination

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General Comments

The assignment brief performed as expected. Most learners demonstrated at least a basic understanding of the unit's content. The most successful learners 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 small proportion of learners had addressed distinction criteria but had failed to address one or more of the merit criteria, therefore limiting their possible attainment.

A significant proportion of learners 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.

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 generally well answered by learners including examples using: 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 were in evidence here; it appears that this cohort of learners relished the challenge. Some video evidence was gathered by some learners.

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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. Many of the learners presented their findings in tabular form – good practice.
P5 Select an appropriate electric motor to power the mechanical system.	This cohort of learners included appropriate choices for motors in their designs. Where a motor is specified, it should list the type and other relevant performance characteristics, such as the power. An image would always help here.
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 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 in evidence 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. The more generic risk assessments weren't considered in-depth enough to address P8 in full.
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 learners' 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 in this series presented witness statements, for their learners written by their tutors that fully corroborated the learners' engagement with activities P9 and P10 – very good practice.
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.	More evidence was presented this year in the use of basic measuring equipment, such as: rulers, electrical test equipment, micrometres etc. Many learners used a personally designed test record sheet to evidence this – good practice.
P12 Create a preventative maintenance schedule for a mechanical system.	P12 was very well-answered across this cohort. Some good evidence was produced with realistic dates timings and was presented in tabular form – good practice.
M1 For two different examples of mechanical	The best answers included the action of gears

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systems, explain how the system changes the magnitude of the force or movement of the input.	with explanations of increasing torque and / or changing speed. Also the use of slider-crank mechanisms to change linear motion into circular motion were well explained. Many learners included images in their explanations, c / w captions, explaining what the images represented; this was 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 (for example, gear boxes) and how the torque could be increased. Some learners provided sound calculations of gear ratios and input / output speeds – best practice.
M3 Identify those that are relevant to the design.	Here, the best scripts took the relevant design considerations and linked them to their own particular design and explained why they were the 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, availability, cost, strength, durability, ease of assembly etc.
M5 Justify the choice of electric motor for the assembled mechanical system.	A high proportion of the learners 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 learners 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.
M7 Justify the use of the selected measurement methods.	Many learners handled this particular criterion well. Video and photographic evidence was used in many cases to evidence this and justify their particular 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; 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.
D3 Evaluate the mechanical system you have	A good account of the trial and testing

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constructed, covering how well the system meets the given specification and how testing supported any improvements made.	methods, of the learners' devices, was in evidence here. Again, many learners used video and photo evidence to present their findings.