TECH LEVEL
ENGINEERING

Mechanical Systems
Report on the Examination

TVQ01019/TVQ01018/TVQ01016
June 2017

Version: 1.0

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General Comments

The assignment brief demonstrated that the majority of students understood the content in a basic way. The most successful students tackled the assignment in an orderly and pragmatic way, which was evident by their attention to detail when furnishing evidence.

Please note the following:

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

A small number of students addressed distinction criteria but had failed to address one or more of the merit criteria, therefore limiting their achievement.

Administration

It was pleasing to see that the majority of students indicated within their portfolios where the individual assessment criteria was addressed, eg 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 students including examples using gears, levers, piston and crank mechanisms etc.
P2 For a given design specification, design a mechanical system to meet the desired outcomes.	A good selection of designs were evidenced and it was apparent that students welcomed the challenge.
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.	Students are quite knowledgeable of available components and their use.
P5 Select an appropriate electric motor to power the mechanical system.	Students 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.
P6	There were some excellent examples of general assemblies produced. Good use of hand drawn

Produce a general assembly diagram of your design, showing the mechanical components.	assemblies proved popular.
P7 Produce a production plan for your product that provides the correct sequence of operations and use of tools.	Some good production plans were evidenced. The best being 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 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, which detailed the students' involvement with the assembly process. Great use of today's technology as a means of evidence gathering. P9 was 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.
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.	This criterion wasn't answered particularly well. More evidence is required, in particular the use of basic measuring equipment, such as: rulers, Vernier callipers, micrometre's etc. This could be included in the form of a test record sheet.
P12 Create a preventative maintenance schedule for a mechanical system.	P12 was well-answered with some good evidence produced with realistic dates timings.

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. The use of slider-crank mechanisms to change linear motion into circular motion, were well explained.
M2	Good answers gave detailed descriptions of components,

Explain the way in which the mechanical components within your mechanical system operate to provide the required outcome.	eg gear boxes and how the speed of the turbine blade was kept to a certain velocity suitable to generate power.
M3 Identify those that are relevant to the design.	The best scripts took the relevant design considerations and linked them to their own particular design.
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 etc.
M5 Justify the choice of electric motor for the assembled mechanical system.	This criteria was not well evidenced by students. More detailed analysis and investigation are needed, which should include consideration of the application requirements, eg function, rpm and cost, 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, after the system was tested some data could have been recorded and used as a basis of a systems' analysis. For example; could the gear box ratio be changed to increase output speed; could the blades of the turbine be altered to catch more of the wind speed etc.
M7 Justify the use of the selected measurement methods.	This criterion was generally poorly addressed. Accuracy and precision should have informed the justification here.

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 method. For example, the justification for a particular gear ratio must be given and shown by calculation; the justification for use of a particular material must be given in terms of low weight, strength, cost etc.
D2 Justify the choice of three of the chosen components and identify possible alternatives.	Justification should include comparisons of various components. A series of advantages and disadvantages for various components would be a suitable method for justification.
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 sound data analysis would be beneficial here. For example, test the system, record the inputs and outputs and calculate an efficiency value. Do the same after the changes have been made and compare the two efficiencies.