#### Problem-solving – 15 marks

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| **Level/mark** | **Problem analysis** | **Problem**  **-solving** | **Modelling** | **Communicating** | **Production of a prototype** |
| 3 (11–15 | The problem | A range of | Excellent | All information | A fully |
| marks) | has been | alternative, | modelling is | is consistently | functioning |
|  | analysed | well-explained | demonstrated | well-organised | and high |
|  | thoroughly, | methods of | using a range | and presented in | quality |
|  | resulting in a | solving the | of techniques | an appropriate | prototype of |
|  | comprehensive | problem is | including 3D, | format. All | the solution |
|  | and accurate | considered in | graphical and | aspects of | has been |
|  | description of | detail. Choice | mathematical. | decision | produced. |
|  | the problem | is justified with | All aspects | making are well |  |
|  | to be solved | reference to | are well- | conveyed. |  |
|  | including | the demands | explained and |  |  |
|  | consideration | of the problem | demonstrate |  |  |
|  | of relevant | resulting in an | that the final |  |  |
|  | variables that | appropriate | outcome |  |  |
|  | may affect the | solution being | should |  |  |
|  | engineered | selected and | function as |  |  |
|  | solution. | developed | desired. |  |  |
|  |  | fully. |  |  |  |
| 2 (6–10 | The problem | Consideration | Good | Most information | A functioning |
| marks) | is accurately | of other | modelling | is organised and | prototype with |
|  | identified with | methods of | of several | presented in | some non- |
|  | most aspects | solving the | aspects of the | an appropriate | critical flaws |
|  | of the problem | problem | development | format. This | has been |
|  | having been | is limited | is | conveys some | produced. |
|  | analysed. | to a single | demonstrated. | aspects of |  |
|  |  | alternative | Some | decision making |  |
|  |  | suggestion | drawings or | but not all |  |
|  |  | with some | records of | choices are |  |
|  |  | detail, or a | other forms | explained. |  |
|  |  | small number | of modelling |  |  |
|  |  | of methods | are annotated |  |  |
|  |  | that lack | and it is clear |  |  |
|  |  | development. | from the |  |  |
|  |  | A mostly | drawings that |  |  |
|  |  | appropriate | the majority |  |  |
|  |  | solution | of ideas are |  |  |
|  |  | is chosen | workable. |  |  |
|  |  | for further |  |  |  |
|  |  | development. |  |  |  |

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| **Level/mark** | **Problem analysis** | **Problem**  **-solving** | **Modelling** | **Communicating** | **Production of a prototype** |
| 1 (1–5 | The problem | A single | Incomplete | Information is | A prototype |
| marks) | is accurately | method of | or partially | confused and | that does |
|  | identified but | solving the | effective | not always | not function |
|  | inconclusively | problem is | modelling is | presented in the | adequately |
|  | analysed. | generated. | demonstrated. | most appropriate | has been |
|  |  | Choices are | An attempt | format. The | produced. |
|  |  | stated but | at annotation | reasoning behind |  |
|  |  | not followed | of drawings/ | why decisions |  |
|  |  | through | modelling may | were made is |  |
|  |  | sufficiently | have been | unclear. |  |
|  |  | to solve the | made but it |  |  |
|  |  | problem. | is not always |  |  |
|  |  |  | clear from the |  |  |
|  |  |  | descriptions or |  |  |
|  |  |  | explanations |  |  |
|  |  |  | that the ideas |  |  |
|  |  |  | are workable. |  |  |
| 0 | Nothing worthy of credit | | | | |

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| FIT Tasks | Task complete? |
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#### Drawings and conventions – 15 marks

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| **Level/mark** | **Development drawings** | **Computer aided design** | **Conventions** | **Annotation** | **Information** |
| 3 (11–15 | Develops, | CAD has | Drawings | Drawings are | All information |
| marks) | justifies and | been used, | consistently | annotated | is consistently |
|  | evaluates a | with effect, | conform to | clearly, | presented in |
|  | detailed and | to produce | sector-specific | accurately and | a clear and |
|  | fully annotated | accurate | standards and | appropriately, | logical manner |
|  | solution | drawings | conventions. | and are easy | that ensures |
|  | that uses | of complex |  | to follow | understanding. |
|  | comprehensive | parts and |  | providing all |  |
|  | and | rendered 3D |  | required detail. |  |
|  | appropriate | presentations. |  |  |  |
|  | engineering |  |  |  |  |
|  | drawings. |  |  |  |  |
| 2 (6–10 | Develops | CAD has | Drawings | Drawings have | Most information |
| marks) | and partially | been used | generally | annotation | is presented in |
|  | evaluates an | to present | conform to | for most | a clear manner. |
|  | annotated | adequate | sector-specific | important | Some detail may |
|  | solution | information | standards and | features, but | be missing or be |
|  | using some | of shape and | conventions | lack sufficient | confusing. |
|  | engineering | size or the | with | detail. |  |
|  | drawings. | function of | occasional |  |  |
|  |  | components | errors or |  |  |
|  |  | to allow | omissions. |  |  |
|  |  | development |  |  |  |
|  |  | to progress. |  |  |  |
| 1 (1–5 | Develops a | CAD has | Drawings use | Drawings lack | Information |
| marks) | solution using | been used | conventions to | any annotation | is difficult to |
|  | a limited range | to attempt | a very limited | other | understand and |
|  | of engineering | to present a | extent or | than brief | lacks clarity. |
|  | drawings. | limited amount | inaccurately. | descriptions or |  |
|  |  | of simple |  | labels. |  |
|  |  | information |  |  |  |
|  |  | about shape |  |  |  |
|  |  | or size. |  |  |  |
| 0 | Nothing worthy of credit | | | | |

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| FIT Tasks | Task complete? |
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#### Production planning – 15 marks

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| **Level/mark** | **Producing and following a plan** | **Explaining the plan** | **Ensuring repeatability and using CNC** | **Sequencing and quality control** | **Health and safety** |
| 3 (11–15 | Produced | A | Planning | Identifies all | Comprehensively |
| marks) | and followed | comprehensive | includes | stages and | details the |
|  | a detailed | and detailed | detail related | explains the | application of |
|  | production | explanation | to the use of | sequence of | health and safety |
|  | plan, covering | of all of the | jigs/fixtures | processes | procedures in all |
|  | most aspects of | stages in the | to ensure | and the | processes. |
|  | production using | production of | repeatability. | quality control |  |
|  | information contained within engineering drawings or circuit diagrams. | an engineered product is provided. | Detailed evidence that jigs or fixtures and/or CNC programming | techniques used to produce the product. |  |
|  |  |  | have been |  |  |
|  |  |  | used. |  |  |
| 2 (6–10 | Produced | A clear and | Evidence of | Identifies the | Details the |
| marks) | and followed | detailed | the planned | main stages/ | application of |
|  | a simple | explanation | use of jigs, | processes and | health and safety |
|  | production | of the main | fixtures | an important | procedures |
|  | plan using | stages in the | or CNC | quality control | in the main |
|  | information | production of | programming, | technique | processes. |
|  | contained within | an engineered | to enable | used to |  |
|  | engineering | product is | repeatable | produce the |  |
|  | drawings or | provided. | outcomes. | product. |  |
|  | circuit diagrams. |  |  |  |  |
| 1 (1–5 | Followed | An outline plan | Evidence of | Identifies | Adheres to |
| marks) | a simple | that identifies | the use of a | the main | health and safety |
|  | production | limited aspects | provided jig/ | process(es) | procedures. |
|  | plan using | of production | fixture or | and mentions |  |
|  | information | is provided. | machining of a | the need |  |
|  | contained within |  | part on a CNC | for quality |  |
|  | engineering |  | machine, using | control when |  |
|  | drawings or |  | a provided | producing the |  |
|  | circuit diagrams. |  | program. | product. |  |
| 0 | Nothing worthy of credit | | | | |

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| FIT Tasks | Task complete? |
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#### Engineering skills used – 15 marks

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| **Level/mark** | **Skill** | **Use of a range of processes and materials** | **Quality control and working to tolerances** | **Level of demand** | **Explanation of processes** |
| 3 (11–15 | The outcome | Used safely a | Applied the | Makes a | Clear and |
| marks) | shows a | wide range of | planned quality | complete, | detailed |
|  | high level of | appropriate: | control to | high-quality | explanations |
|  | skill across a number of processes, with work completed accurately. | * materials * parts * components * processes * tools * equipment. | all stages of manufacture to make their product.  The engineered product meets the tolerances stated. | engineered product with a high level of demand. | of which alternative processes were considered, justifying why particular methods have been used. |
| 2 (6–10 | The outcome | Used safely a | Applied the | Makes an | Simple |
| marks) | shows an | small range of | planned quality | incomplete, | explanations of |
|  | acceptable | appropriate: | control to a | high level | why particular |
|  | level of skill across a number of processes, with most work completed accurately. | * materials * parts * components * processes * tools * equipment. | limited number of stages.  The engineered product is made within some of the tolerances stated. | of demand engineered product **or** a complete low level of demand product. | processes were used. |
| 1 (1–5 | The outcome | Used safely | Applied quality | Makes an | The processes |
| marks) | shows a | a very limited | control to a | incomplete, | that have been |
|  | limited amount | range of: | single stage. | low level | used are stated. |
|  | of skill with little work completed accurately. | * materials * parts * components * processes * tools | The engineered product is  not made to any stated tolerances. | of demand engineered product. |  |
|  |  | * equipment. |  |  |  |
| 0 | Nothing worthy of credit | | | | |

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| FIT Tasks | Task complete? |
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#### Applying systems technology – 10 marks

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| --- | --- | --- |
| **Level/mark** | **Application of systems technology** | **Explanations of systems technology** |
| 5 (9–10 marks) | Identifies and explains in detail two or more of the systems and technologies used in the engineered product to organise and control the function of the product. | Detailed block diagrams are produced for multiple systems with all sub-systems and feedback explained. |
| 4 (7–8 marks) | Identifies and explains one or more systems technology  used in the engineered product to organise and control the function of the product. | A complex block diagram for one or more systems with sub- systems or feedback explained. |
| 3 (5–6 marks) | Explains in general terms a single systems technology used in the engineered product and how it operates. | A systems block diagram, including an explanation of each of the blocks as a system or shown diagrammatically with explanation. |
| 2 (3–4 marks) | Displays a basic understanding of the systems technology used in the engineered product. Descriptions lack accuracy. | A linear systems block diagram where more than one operation is described. |
| 1 (1–2 marks) | Shows a limited awareness of the systems technology used in the engineered product but descriptions lack any detail. | A simple systems block diagram is produced consisting of a single input/process/output operational structure. |
| 0 | Nothing worthy of credit | |

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| FIT Tasks | Task complete? |
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#### Testing and evaluating – 10 marks

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| **Level/mark** | **Testing** | **Evaluating** |
| 5 (9–10 marks) | Undertaken detailed and objective testing of all aspects of the product using a variety of testing techniques to compare with a comprehensive specification.  An explanation of how quality is maintained through testing, detailing methods that ensure the work is within tolerance. | A comprehensive analysis and evaluation of all aspects of the completed product, both systems operation and manufacture.  Well-reasoned suggestions made for how and why possible improvements could be made. |
| 4 (7–8 marks) | Undertaken appropriate testing of most aspects of the product and provided an informative comparison to the product specification.  Quality control methods applied consistently to ensure all aspects of work are within tolerance. | A detailed analysis and evaluation of the completed product, explaining how and why either systems operation or manufacture could/needs to be improved. |
| 3 (5–6 marks) | Undertaken a range of basic testing on the product using a variety of techniques comparing the results to the product specification.  An explanation of the method used to ensure quality is maintained. | An analysis and evaluation of the completed product,  explaining why it needs to be improved. |
| 2 (3–4 marks) | Undertaken testing of limited aspects of the product with comparison to the product specification, using a single technique.  Some quality issues addressed. | A limited analysis and evaluation of an aspect of the completed product, stating why it needs to be improved. |
| 1 (1–2 marks) | Undertaken testing of a single aspect of the product with comparison to the product specification.  Has a minimal awareness of quality issues. | Limited analysis and evaluation of an incomplete product. |
| 0 | Nothing worthy of credit | |

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| FIT Tasks | Task complete? |
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