Mark Scheme (Final)

January 2017

NQF BTEC Level 1/Level 2 Firsts in Engineering

Unit 9: Interpreting and Using Engineering Information (21174E)

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Question Number	Answer	Mark
1a	B – current (1) D – voltage (1)	2

Question Number	Answer	Mark
1bi	Award **one** mark for any of the following: • sketch • schematic diagram • flow chart/Gantt chart/Pareto chart • physical layout diagram • illustration from manufacturers' manuals **Accept any other appropriate response.** **Do not accept responses associated with 'working drawings' as defined by topic A1 in the Unit Specification**	1

Question Number	Answer	Mark
1bii	Award **one** mark for any of the following: • component • general assembly/sub-assembly • fabrication • welding • repair/modification • installation • exploded diagram • wiring/circuit diagram • orthographic projections(first and third angle drawing) • isometric • oblique **Accept any other appropriate response.** **Do not accept responses associated with 'graphical representations' as defined by topic A1 in the Unit Specification**	1

Question Number	Answer	Mark
1c	Award **one** mark for any of the following up to a maximum of **two** marks. • There are no language barriers/universally recognised (1) • Drawings use symbols to represent features (1) • Uses standard layouts/formats (1) • Prevents any misinterpretation of the information being communicated/easier to understand/follow (1) • Components could be designed in one country and manufactured in another (1) • Many companies are multinational/global businesses (1) **Accept any other appropriate response.**	2

Question Number	Answer	Mark
2ai	Award **one** mark for any of the following: • radius (1) • rad (1) • radii (1) **Accept any phonetic spelling**	1

Question Number	Answer	Mark
2aii	Award **one** mark for any of the following: • diameter (1) • dia (1) **Accept any phonetic spelling**	1

Question Number	Answer	Mark
2bi	Award **one** mark for correct calculation of the overall width. Overall width of x = 188 **Accept any correct answers with or without units**	1

Question Number	Answer	Mark
2bii	Award **one** mark for correct calculation of the overall height. Overall width of y = 131 **Accept any correct answers with or without units**	1

Question Number	Answer	Mark
2c	• A – Operation sheet (1) • E – Test schedule (1)	2

Question Number	Answer	Mark
3ai	Award **one** mark for any of the following: • danger of death (1) • caution (1) • caution trip hazard (1) • slippery surface/wet floor (1) • highly flammable/fire hazard (1) • high voltage (1) • biohazard (1) • irritant (1) • harmful (1) • poison/toxic (1) • risk of explosion (1) • corrosive material (1) • industrial vehicles (1) • laser beam (1) • overhead load (1) • biological risk (1) • low temperature (1) • oxidant (1) • radioactive (1) • dangerous to the environment (1) **Accept any other appropriate response.** **Do not accept 'mandatory' or 'safe condition' signs as found in Topic A4 in the Unit Specification**	1

Question Number	Answer	Mark
3aii	Award **one** mark for any of the following: • use of guard/s (1) • guard/s (1) • guarding required (1) • guarding machinery (1) • close the door/shutter (1) **Accept any other appropriate response.** **Do not accept 'machinery', 'machining hazard', 'heavy machinery' and 'do not access'**	1

Question Number	Answer	Mark
3b	Award **one** mark for a reason and **one** additional mark for appropriate expansion, up to a maximum of **two** marks. • Standardised layouts and colours are quickly/easily recognised (1) as certain colours have specific meanings (1) • Signs need to meet British/European standards (1) to prevent confusion caused by unfamiliar formats (1) • Universally/internationally recognised (1) therefore there is no misunderstanding by those who speak other languages (1) • To reduce manufacturing costs/time (1) as multiple colours/shapes use additional resources (1) **Accept any other appropriate response.**	2

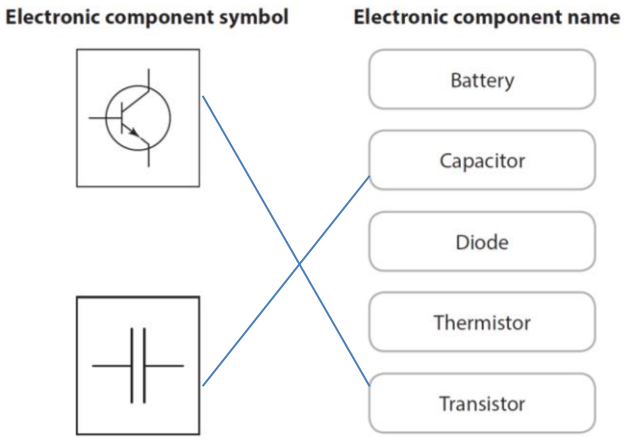
Question Number	Answer	Mark
3c	Award **one** mark for an advantage and **one** additional mark for appropriate expansion, up to a maximum of **two** marks. • Technicians are aware of hazards/control measures/PPE (1) reducing the likelihood of accidents/injuries (1) • Can improve worker morale (1) creating a safe working environment/improve production (1) • Technicians are aware of safe methods of working/operating procedures (1) removing the need for guesswork over control measures (1) • Allows technicians to prepare safety equipment (1) in advance of processes being carried out (1) • Reduces the number of accidents/injuries (1) allowing production to run smoothly/efficiently (1) **Accept any other appropriate response.**	2

Question Number	Answer	Mark
4a	A – Surface textures D - Fixed reference points	2

Question Number	Answer	Mark
4b	Award **one** mark for each of the following, up to a maximum of **two** marks. • Job cards contain all the information needed for the batch (1) • A job card provides a checklist to make sure everything is completed correctly (1) • A job card clearly identifies batch/activity completion dates (1) • The job card shows other documentation that is needed for the batch (1) • Records/maintains quality assurance Information for auditing purposes (1) • Aligns/tracks the production activities to sales order requirements (1) • Aligns the materials requirements to the batch of parts (1) • Determines the order quantity required for the batch (1) • To ensure all products in the batch are identical (1) • To inform sub-contractors/other employees of the job requirements (1) **Accept any other appropriate response.**	2

Question Number	Answer	Mark
4c	Award **one** mark for any of the following, up to a maximum of **two** marks. • Projects are broken down into individual activities (1) • Engineers can see which activities are dependent on each other (1) • Indicates visually how long an activity/project will take to complete (1) • Engineers can clearly see deadlines/milestones (1) • Indicates start and finish times (1) • Late/early completion of tasks can be identified and actions taken (1) • Can be updated to show progress on a regular basis (1) • Can be shared with suppliers/customers/employees (1) **Accept any other appropriate response.**	2

Question Number	Answer	Mark
5a	Award **one** mark for any of the following, up to a maximum of **two** marks: • title block (1) • company logo (1) • parts list (1) • company name (1) • drawing number (1) • drawing/part name (1) • version/revision number (1) • scale/ratio (1) • material (1) • drawn by (1) • checker (1) • general tolerance (1) • border (1) • gridlines (1) • projection symbol (1) • date (1) • units (1) **Accept any other appropriate response.** **Do not accept drawing features such as line types e.g. centre line, hidden detail**	2

Question Number	Answer	Mark
5b	Award **one** mark for each correctly matched electronic symbol, up to a maximum of **two** marks.  	2

Question Number	Answer	Mark
5c	Award **one** mark for an advantage and **one** additional mark for appropriate expansion, up to a maximum of **two** marks. • Reduces the need for the vending machine assembly company to test the boards themselves (1) because test reports will confirm boards work as designed (1) • Reduces manufacturing time for the vending machine assembly company (1) because not all circuit boards will need to be tested before installation (1) • The vending machine assembly company has detailed test values for each circuit board (1) therefore they can discard circuit boards that potentially/prematurely may fail (1) • Provides the vending machine assembly company with QA/QC data (1) helping with traceability/audits/ISO9000 (1) • Reduces the possibility of sending out faulty machines (1) as test reports confirm that the circuit boards are fit for purpose (1) • Helps with any fault finding and resolution during final assembly (1) as the test results are available for troubleshooting (1) • Product improvement (1) using trend data from faulty boards/test reports (1) • As every circuit board is pre-tested/certified (1) minimising complaints/customer returns/improve reputation (1) **Accept any other reasonable response.**	2

Question Number	Answer	Mark
5d	Award **one** mark for an advantage and **one** additional mark for appropriate expansion to a maximum of **two** marks, up to a maximum of **four** marks. • Relevant computer-based working drawings will not be lost/can be backed-up (1) minimising DT88 Engineering's costs associated with printing/distribution/redrawing (1) • Working drawings can be password protected/encrypted (1) restricting access to personnel authorised by DT88 Engineering (1) • DT88 Engineering does not need to spend time locating working drawings for technicians (1) as drawings for all current/discontinued circuit boards are available globally (1) • Reduces the risks of DT88 Engineering needing to manufacture replacement circuit boards (1) because technicians will have access to authorised/accurate working drawings to make repairs correctly (1) • Drawings will be free from graffiti/damage (1) meaning less misinterpretation of drawings **Do not accept 'low cost' as a response without justification.** **Accept any other appropriate response.**	4

Question Number	Answer	Mark
6a	Award **one** mark for a reason and **one** additional mark for the appropriate expansion to a maximum of **two** marks, up to a maximum of **four** marks. • Tapping and clearance hole sizes shown (1) as different sizes of holes will need to be drilled into the plates (1) • Allows the technician to select the correct sizes of thread (1) based on the fastenings being used (1) • It is a useful pocketbook (1) that conveniently contains all relevant information to support machining operations (1) • Allows technicians to select either metric or imperial drill sizes for holes (1) because conversion charts are included (1) • ISO standards are available for a range of shaft sizes with related limit/fits sizes (1) allowing for accuracy in the selection of tools (1) **Accept any other appropriate response.** **Do not accept "contains information" without justification/explanation.**	4

Q**uestion Number**	**Answer**	**Mark**
6b	Award **one** mark for an advantage and **one** additional mark for the appropriate expansion to a maximum of **two** marks, up to a maximum of **four** marks. • Process documentation ensures the plates are installed correctly/in the correct orientation (1) preventing possible failure of the structure (1) • Process documentation ensures structures are assembled the same way (1) as installers will know the order in which components should be assembled (1) • Process documentation ensures the correct method of fixing will be used (1) preventing the mounting plates from being damaged (1) • Process documentation can be used as a QA/QC document (1) assisting with the customer's auditing/ISO9000 system (1) • Process documentation shows safe installation/instructions (1) ensuring installers/customers/users are protected from injury (1) **Accept any other appropriate response. Only accept responses associated with assembly/installation.**	4

Question Number	Indicative content	Mark
7	**General considerations for multiple types of drawing** • Single drawing types are unlikely to show all of the information required for manufacture and assembly • Machine operators only need machining drawings, casting operatives only require casting drawings, assembly workers only require assembly drawings • Very difficult for draughtsman/woman to produce such a detailed/large drawing for the whole gearbox • Combinations of drawings will allow for the gearbox to be manufactured and assembled as specified • Prevents errors caused by too much information on one drawing • Clarifies to technicians how parts should be made within tolerances • Reduces the risks of components being manufactured incorrectly • Reduces the likelihood of gearboxes being assembled incorrectly • Allows the final gearbox to function as specified • Allows different technicians to work on parts independently • Individual technicians are only provided with the information that they need for the task they are working on • Errors in drawings may not be identified if they are only observed by one technician • Drawings could become misplaced/lost/damaged leading to errors in manufacture/assembly **Model answer** It would be very difficult for the company to be able to guarantee that gearboxes are able to function as specified if all manufacturing and assembly details are included in one diagram. Technicians could become confused by the amount of detail shown, or would need to make guesses if information has been left off the drawing so that features can be seen more clearly. It is important that the gearbox is assembled correctly, therefore there should be assembly drawings to show how components fit together so that they will function as intended. Component drawings would need to be used to show dimension and tolerances for individual parts of the gearbox. Whilst it is possible for a simple assembled product to be represented using a single drawing type, the accuracy required for a gearbox to work as intended also requires	8

	different types of drawing to be used to allow parts to be made accurately and the assembly to be as specified.	

Level	**Descriptor**
0 0 marks	No rewardable material
1 1-3 marks	A few key points identified, or one point described in some detail. The answer is likely to be in the form of a list. Only one type of drawing considered or a range of drawings only identified. Points made will be superficial/generic and not applied/directly linked to the situation in the question. Limited knowledge of the use of a range of types of drawings will be evident.
2 4-6 marks	Some points identified, or a few key points described. Consideration of more than one type of drawing but there will be more emphasis on one of them. Most points made will be relevant to the situation in the question, but the link will not always be clear. A good understanding of the use of a range of types of drawings will be evident.
3 7-8 marks	Range of points described, or a few key points explained in depth. A range of drawings are considered and the reasons for use are justified. The majority of points made will be relevant and there will be a clear link to the situation in the question. A developed understanding of the use of a range of types of drawings will be evident.

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