



Mark Scheme (Results)

January 2015

NQF BTEC Level 1/Level 2 Firsts in
Engineering

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

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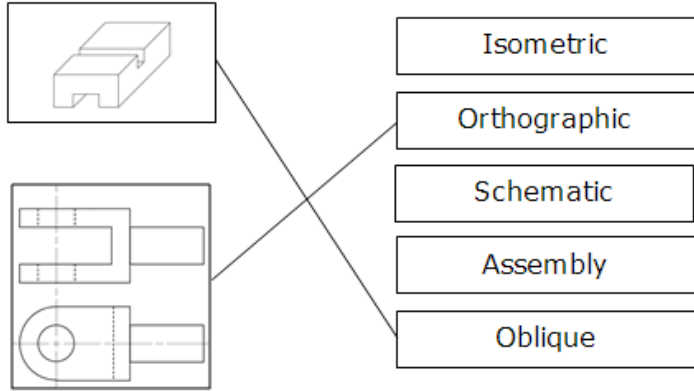
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Question Number	Answer	Mark
1 (a)	A Assembly point	1

Question Number	Answer	Mark
1 (b) (i)	D Blue and white	1

Question Number	Answer	Mark
1 (b) (ii)	<p>Award 1 mark for each of the following answers, up to a maximum of 2 marks.</p> <ul style="list-style-type: none"> • Danger of death (1) • Caution (1) • Caution trip hazard (1) • Slippery surfaces/wet floor (1) • Highly flammable/flammable/fire hazard (1) • High voltage (1) • Biohazard (1) • Irritant (1) • Harmful (1) • Skin irritancy/sensitisation (1) • Carcinogenicity and respiratory sensitisation (1) • Contains gas under pressure (1) • Poison (1) • Risk of explosion (1) • Toxic (1) • Corrosive (1) • Radioactive/radiation (1) • Caution/danger (1) <p>Accept any other appropriate response.</p>	2

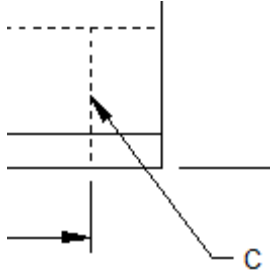
Question Number	Answer	Mark
2 (a) (i)	<p>Award 1 mark for each drawing matched to the correct drawing name, up to a maximum of 2 marks.</p>  <p>No mark awarded where more than one line is drawn from each drawing.</p> <p>Accept no variations</p>	2

Question Number	Answer	Mark
2 (a) (ii)	<p>Award 1 mark for each of the following responses, up to a maximum of 2 marks</p> <ul style="list-style-type: none"> • Able to see individual parts/parts list (1) • Can clearly see how each part is assembled (1) • To show detail that is otherwise hidden on other drawing types (1) • Can be used to build a complex set of instructions (1) • To allow each part to be named/labelled (1) • To follow instructions to enable a product to be manufactured (1) • To prepare a report or descriptive text about a product/topic (1) • To understand/determine a sequence of assembly (1) <p>Accept any other appropriate response.</p> <p>Do not accept 'easy to interpret/understand' without qualification.</p>	2

Question Number	Answer	Mark
2 (b) (i)	B -5 -14	1

Question Number	Answer	Mark
2 (b) (ii)	28.033mm +0.033mm Do not accept '+33' on its own.	1

Question Number	Answer	Mark
2 (b) (iii)	<p>A linked response, award 1 mark for identifying each reason and 1 mark for the extension, up to a maximum of 4 marks:</p> <ul style="list-style-type: none"> • So tolerances do not have to be written on the engineering drawings (1) as they could become very confusing/difficult to interpret (1) • So standard drawings can be used (1) to reduce overall lead times to manufacture parts (1) • So parts are made to an internationally recognised standard (1) to ensure they mate/fit together accurately (1) • To allow easier design of a gauging system (1) as the chart allows application of standard tolerances (1) • To allow a standard range of tools to be sourced/used/replaced (e.g. reamer) (1) which ensures expensive specialist tooling is not required (1) • There is a visual representation of the type of fit that will be produced (1) which helps with the design for assembly purposes (1) • Standard stock guide pillars and bushes/components are manufactured to these specifications (1) therefore interchangeability is assured (1) <p>Accept any other appropriate response. Do not accept response easier/cheaper/faster/more accurate without appropriate justification.</p> <p>Do not accept 'max/min sizes are identified'.</p>	4

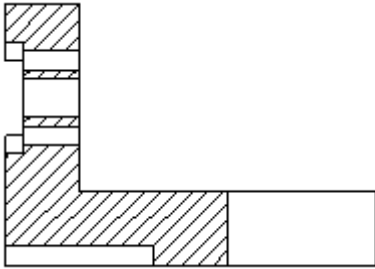
Question Number	Answer	Mark
3 (a)	Answer C 	1

Question Number	Answer	Mark
3 (b)	Pitch Circle Diameter Accept any recognisable spelling (phonetic) of the above answer. Accept no variations	1

Question Number	Answer	Mark
3 (c)	<ul style="list-style-type: none"> • 20 • Twenty • 20 mm • twenty mm Accept no other variations	1

Question Number	Answer	Mark
3 (d)	Award 1 mark for each error identified and 1 mark for each extension, up to a maximum of 4 marks. <ul style="list-style-type: none"> • Incorrect projection symbol used (1) so engineers could misinterpret the positioning of any detail (1) • Hole sizes not specified (1) so the engineer will not be able to drill the holes (1) • Radius size not specified on plan view (1) so the engineer does not know what size cutter to use (1) • Incorrect linetype used on front view for angled part (1) so the engineer may interpret the feature as only being on one side (1) • Missing slot detail off the end view (1) so the engineer may fail to include this during manufacture (1) • Inconsistent use of hidden detail linetype 	4

	<p>(1) means that it has not been drawn to standard conventions (1)</p> <ul style="list-style-type: none"> • Inappropriate positioning of 20 mm dimension on front view (1) as it is obscuring other drawing information (1) • One of the 40 mm dimensions in the front elevation is wrongly positioned (1) as this would normally be to the centre line of the slot (1) • PCD linetype drawn incorrectly (1) as it is not clearly a centre line (1) • Extension line is touching the component (1) therefore the engineer may interpret that it's part of the component (1) • Radius not aligned with component edge (1) therefore the engineer may interpret that a step/other detail may be required (1) • No angular dimension/size (1) therefore the engineer doesn't know what taper is required (1) <p>Accept any other appropriate response.</p>	
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Question Number	Answer	Mark
3 (e)		1

Question Number	Answer	Mark
3 (f)	<p>Award 1 mark for each of the following up to a maximum of 2 marks.</p> <ul style="list-style-type: none"> • Image seen from three directions (1) • Allows direct dimensioning to each view (1) • Shows the relationship of common edges/sides (1) • Produced to a set of standards/conventions eg. tolerances (1) • Multiple views allow you to space dimensioning out (1) • Can show part sections (1) • Shows hidden detail (1) • Shows all dimensions/measurements/details required (1) <p>Accept any other appropriate response. Do not accept 'easier to understand/interpret'</p>	2

Question Number	Answer	Mark
4 (a)	B – ADJLM	1

Question Number	Answer	Mark
4 (b)	19 Accept no variations	1

Question Number	Answer	Mark
4 (c)	<p>A linked response, award 1 mark for identifying each advantage and 1 mark for each extension, up to a maximum of 4 marks:</p> <ul style="list-style-type: none"> • Enables the production manager to calculate the float for each activity (1) which tells the production manager exactly how long an activity can come in late without impacting on the assembly schedule (1) • Enables the production manager to reduce the project duration (1) by undertaking concurrent activities/applying compression techniques (1) • Increases visibility of the impact of scheduled revisions (1) to ensure awareness when major milestones have been missed/when there is a risk of missing a milestone when it comes close (1) • Allows the production manager to identify the most critical activities quickly (1) allowing the production manager to respond to the negative risk of going over-schedule (1) • Allows for good visual communication between workers (1) as chart can be printed and placed on walls for everyone to stay focused (1) • Can be linked to a Gantt chart (1) allowing the production manager to see exactly how far ahead/behind the project is (1) • When planning completion time, the production manager can identify different routes/risk aspects (1) which allows them to realign resources to the critical activities to improve completion time (1) <p>Accept any other appropriate response.</p>	4

Question Number	Answer	Mark
5 (a)	<p>Award 1 mark for each of the following up to a maximum of 2 marks.</p> <ul style="list-style-type: none"> • Sequence of operations (1) • Description of operations (1) • Health and safety (1) • Materials requirements (1) • Components requirements (1) • Feeds and speeds (1) • Tools and equipment (1) • Quality control checks (1) • Timings (1) • Quantity required (1) • Part name/number (1) • Drawing number (1) <p>Accept any other appropriate response.</p> <p>Do not accept two responses from the same type (e.g. two types of health and safety PPE requirements).</p> <p>Do not accept cost.</p> <p>Do not accept generic responses eg. the date, page number, company/customer name/logo.</p>	2

Question Number	Answer	Mark
5 (b)	<p>A linked response, award 1 mark for identifying the related document and 1 mark for the extension, up to a maximum of 2 marks:</p> <ul style="list-style-type: none"> • Reference tables/charts (1) that provide the correct seal size with specific tolerances (1) • Statistical process control (1) that informs whether the seals are in tolerance so that sudden variations can easily be detected (1) • Pareto charts (1) that are used to visually display the vital factors that affect the manufacture of the seals (1) • Drawings giving sizes (1) that would allow QC checks to ensure seals are within specification (1) • Calibration data (1) to ensure measuring equipment is fit for purpose (1) • Product/customer specifications (1) that would allow QC checks to be designed/carried out (1) <p>Accept any other appropriate response.</p>	2

Question Number	Answer	Mark
5 (c)	<p>A linked response, award 1 mark for identifying the reason and 1 mark for the extension, up to a maximum of 2 marks:</p> <ul style="list-style-type: none"> • The test report would contain information about the optimum working temperatures of the material (1) and this would reduce the possibility of failure in very cold conditions (1) • The test report would contain a test specification code (1) allowing the engineer to check the test used was appropriate for the specific operating conditions of the forklift truck (1) • The test report would contain information about the properties of the material (1) which would allow the engineer to determine how much pressure/force the seal could withstand (1) <p>Accept other appropriate answers.</p>	2

Question Number	Answer	Mark
6 (a)	<p>Award 1 mark for each of the following responses, up to a maximum of 2 marks</p> <ul style="list-style-type: none"> • Damaged drawing could mean information is missing eg. due to rips, tears, folds (1) • Drawing becomes difficult to read (1) • Graffiti could obscure a dimension/line/section (1) • Misinterpretation of drawing information (1) • Increased time spent interpreting information (1) • Annotations might be thought to be official information (1) <p>Accept any other appropriate response.</p>	2

Question Number	Answer	Mark
6 (b)	<p>A linked response, award 1 mark for identifying each disadvantage and 1 mark for an extension, up to a maximum of 4 marks:</p> <ul style="list-style-type: none"> • Maintenance/training cost/time of ICT-based system wasted (1) as no requirement for drawings to be accessed by those not involved in designing/producing the one-off component (1) • ICT-based control/storage of obsolete files could cause confusion (1) as no requirement to reuse one-off drawings (1) • ICT-based control/storage of obsolete files could encourage employees to edit existing drawings (1) which could lead to compliance issues (1) • Individual drawings unlikely to be accessible after a certain amount of time (1) as no requirement to update files as technology changes (1) • In a one-off environment, system would be rarely used/less familiarity with the system (1) which means the application of the technology would be wasted (1) <p>Accept any other appropriate response.</p> <p>Do not accept generic disadvantages of ICT based systems.</p>	4

Question Number	Indicative content	Mark
6 (c)	<p>Possible impact If 7PX Engineering were to introduce a scheduled maintenance plan then it could increase the life span of its aluminium tubing machinery. Machinery could be maintained at regular intervals as recommended by the machine manufacturers. Investing time and money into planned maintenance procedures would result in a much smoother/ more efficient operation and probably more consistent manufacture of products would take place with less downtime as a result of unscheduled breakdowns.</p> <p>Advantages of having a scheduled maintenance plan:</p> <ul style="list-style-type: none"> • Allows manufacturer to decide when it will stop production • Cost effective in terms of capital intensive processes • Flexibility allows for the adjustment of maintenance frequency • Increased machine component life cycle • Energy savings through machine efficiencies • Reduced equipment/process failure • Less unscheduled downtime • Reduced labour requirements as scheduling maintenance optimises employee time • Utility expenses are reduced by the continuous maintenance program <p>Disadvantages of having a scheduled maintenance plan:</p> <ul style="list-style-type: none"> • Catastrophic failure still a possibility • Can be labour intensive with an array of machines to keep maintained on a regular basis • Potential for incidental damage to components in conducting unnecessary maintenance • May result in excessive maintenance (costs) and unnecessary overhauls if production rates drop • Failure to deliver products/goods on time, with possible loss of future business as a result of interruptions to operations <p>Model answer 7PX Engineering could introduce a scheduled</p>	8

	<p>maintenance plan as this has the potential to increase the life of each of the machine parts/components. In doing so, the manufacturer will be able to deliver a more efficient operation with large cost savings as there will be less machine downtime caused by catastrophic part failures of a particular machine. This will also lead to streamlining maintenance staff requirements as scheduling will optimise the maintenance teams time and production can be halted when most appropriate; however, the manufacturer needs to consider that failure can still occur with a scheduled maintenance plan as some parts can get damaged when conducting unnecessary maintenance. Parts/components could also be changed when there is no apparent wear/damage, which would waste time and money. In addition, failure to deliver goods/products or services can have a knock on effect with possible future loss of business; however, the introduction of a scheduled maintenance plan could also boost employee morale as it will relieve the frustration of unscheduled breakdowns.</p>	
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 impact considered. Points made will be superficial/generic and not applied/directly linked to the impact of a scheduled maintenance plan. The learner has a limited understanding of the impact of a scheduled maintenance plan.	
2 4-6 marks	Some points identified, or a few key points described. Consideration of more than one impact but there will be more emphasis on one of them. The answer is unbalanced. Most points made will be relevant to the impact of a scheduled maintenance plan schedule but the link will not always be clear. The learner has a good understanding of the impact of a scheduled maintenance plan.	
3 7-8 marks	Range of points described, or a few key points explained in depth. All sides of the case are considered and the answer is well-balanced, giving weight to all impacts. The majority of points made will be relevant and there will be a clear link to the impact of a scheduled maintenance plan. The learner has a developed understanding of the impact of a scheduled maintenance plan.	

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