

1145-20 L2 Technical Award in Engineering

Level 2 Engineering – Theory test (1) March 2018

Marking scheme

Q	Acceptable answer(s)	Guidance	Max mks	Ref
1a	Across flats.		(1 mark)	201 1.2 AO1
1b	When a countersunk screw is placed in the drill hole to allow the head (1) to sit flush with the surface (1).		(2 marks)	201 3.1 AO2
1c	Award up to 3 marks as follows: 1 mark for stating it improves the ability of the material to be gripped, 1 mark for a specifying that this is a pattern of straight or crossed lines on the surface of the material. 1 mark for cut or rolled into the material surface, 1 mark for stating that it is typically made using a lathe.		(3 marks)	201 3.1 AO2
1d	Quicker to make a virtual model. No need to purchase physical parts. Doesn't need additional staff to create. Any other suitable response.	Award 1 mark for each correct response to a maximum of 3 marks.	(3 marks)	202 3.1 AO2
1e	i) C ii) D	1 mark 1 mark	(2 marks)	201 1.2 AO1
1f	Award 1 mark for each of the following. • To the left of the line. • In the middle.		(2 marks)	201 1.2 AO1
2a	i) The resistance of a material to breaking/rupturing under compression (1). ii) The ability of a material to resist fracturing under impact loading (1).	Award 1 mark for each correct response.	(2 marks)	202 1.1 AO1
2b	Drilling.		(1 mark)	202 2.1 AO1

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2c	<p>Wear goggles (1) – to protect eyes from flying swarf (1).</p> <p>Use machine guard (1) – to reduce risk of entanglement in rotating parts (1).</p> <p>Ensure chuck key is removed (1) – to prevent chuck key being ejected towards the operator (1).</p> <p>Ensure workpiece is held to the machine bed (1) – to prevent workpiece being thrown out of machine (1).</p> <p>Any other suitable response.</p>	<p>Award up to a maximum of 4 marks.</p> <p>Marks can only be awarded for a maximum of two precautions with appropriate reason.</p>	(4 marks)	202 2.1 AO2
2d	<p>i) Aircraft fuselage. Cans. Foil. Pans.</p> <p>ii) Plastic windows. Clothing. Children’s toys. Any other relevant response also accepted.</p> <p>iii) Spectacle frames. Metal muscles in robot arms. Thermostats. Sprinkler systems. Any other relevant response related to Shape Memory Alloy.</p>	<p>Award 1 mark for each correct response.</p>	(3 marks)	202 1.2 AO1
2e	<p>TIG welding uses a tungsten electrode (1) with an inert shielding gas (1).</p> <p>An arc is formed between the electrode and the workpiece (1). The workpiece has to be connected to the return of the power supply to make a complete circuit (1). Where the arc contacts the metal, it melts the metal (1), causing it to fuse together to form the joint (1).</p> <p>Once completed, the weld surface can be dressed or cleaned (1).</p>	<p>Award up to maximum of 6 marks.</p>	(6 marks)	202 2.2 AO1
3a	<p>Prevents oxidation of the metal ends of the electrical components (1) by shielding the molten metal from the atmosphere (1).</p> <p>Allows the solder to flow freely as the solder melts (1) and effectively wet the PCB surface (1).</p>	<p>Award 1 mark for each relevant purpose up to a maximum of 3 marks.</p>	(3 marks)	202 2.2 AO2

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3b	297 ohms 363 ohms	(1 mark) (1 mark)	(2 marks)	201 3.2 AO2
3c	i) Award 1 mark for: to store charge; and 1 mark for a suitable example, such as part of a timer circuit. ii) Award 1 mark for: it only allows electricity to pass in one direction; and 1 mark for a suitable example, such as protecting a circuit from back emf created by a motor.		(4 marks)	201 3.2 AO2
3d	Award 1 mark each for the following. <ul style="list-style-type: none"> The ammeter must be in series within the circuit. The voltmeter must be in parallel to the component(s) where it is measuring the potential difference. 		(2 marks)	201 3.2 AO2
3e	Advantages: Better data security (1) as it is harder to remove a physical copy than a digital copy (1). Users do not need to be trained in use of CAD software (1) nor is it necessary to buy CAD software (1). Harder to corrupt data in a physical copy (1). Disadvantages: Longer to produce (1) and less accurate (1). Space required to save is greater (1). Takes longer to make changes as whole drawing needs to be redrawn (1). Not as easy to share (i.e. need to send hard copy) (1).	Other suitable answers are acceptable. Award marks up to a maximum of 6 marks. Candidates can give any combination for number of advantages and disadvantages.	(6 marks)	201 2.1 AO2
4a	0.5 mm.	1 mark	(1 mark)	201 4.3 AO1
4b	i) m ³ ii) m ² iii) W	1 mark each .	(3 marks)	201 4.1 AO1
4c	Voltage, current, resistance, capacitance.	1 mark each . Any three , to a maximum of 3 marks.	(3 marks)	201 4.3 AO1
4d	<ul style="list-style-type: none"> Place object between reading faces. Tighten faces by turning thimble clockwise. Tighten until hear clicking of ratchet. Read the displayed value. 	Award 1 mark for each relevant point in the process up to a maximum of 3 marks.	(3 marks)	201 4.3 AO1

Q	Acceptable answer(s)	Guidance	Max mks	Ref
5a	<ul style="list-style-type: none"> • Make a pattern. • Split pattern. • Put moulding boards/case around pattern and secure. • Apply parting dust/sand. • Ram mould with green sand. • Level sand/strickling. • Secure base moulding board and turn over. • Remove pattern. • Repeat for the other side of the mould. 	Award 1 mark for each relevant point in the process up to a maximum of 5 marks.	(5 marks)	202 2.1 AO1
5b	<p>Allows for shrinkage of the casting metal/alloy (1). Acts as funnel for the molten casting metal/alloy during pouring (1). Allows for the escape of air from the casting (1). Results in a better quality casting/avoids casting defects (1).</p>	Award 1 mark for each relevant purpose up to a maximum of 3 marks.	(3 marks)	202 2.1 AO2
5c	<p>Uses a single step process that in one activity will produce the product (1), whereas machining would use several operations to produce the different features in the product (1). This means that part can be produced more quickly (1) and at lower cost (1). Materials can be recycled (1). Any other relevant point.</p>	Award 1 mark for each relevant point up to a maximum of 4 marks.	(4 marks)	202 2.1 AO2
6	<p>Indicative content</p> <p><i>Safety</i> Access to or absence of rotating parts. Issues relating to size. Issues relating to stability.</p> <p><i>Portability</i> Relative size and weight. Footprint.</p> <p><i>Function</i> Method of air movement. Method of activation. Power supply.</p> <p><i>Cost</i> Relative cost. Materials and manufacturing considerations.</p> <p><i>Suitable to be manufactured in large volumes</i> Impact of volume required on process selection.</p>	<p>Band descriptors No answer worthy of credit, e.g. insufficient work submitted, answer not relevant to the question, answer is factually incorrect. (0 marks)</p> <p>Band 1 – basic – largely descriptive response based on recall of knowledge, including direct comparison of a few design features. Consideration has been given to some of the design criteria. Candidates at the top of this level may be characterised by showing some understanding of the reasons for one or two design features relative to the design criteria. (1-4 marks)</p>	(12 marks)	201 3.1, 3.2, 4.1, 4.2 202 1.1, 1.2, 2.1, 2.2, 4.1

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	<p><i>Sustainability</i> End of life disposal. Recyclability of materials. Potential for repair or replacement.</p>	<p>Band 2 – clear – more detailed response, considering most of the specified design criteria. Shows recall of knowledge and understanding of the reasons for most of the design criteria and the interaction of the design criteria and the user. Candidates at the top of this level may be characterised by analysing the relative impact of the different products. (5-8 marks)</p> <p>Band 3 – detailed – very detailed response, showing an understanding of the full range of the design criteria. A broad range of impacts are evaluated, with substantiation of which have the more significant effect and producing supporting conclusions. Candidates at the top of this level may be characterised by analysing and evaluating the positive and negative implications of the design criteria in a broader context (such as, for example, on customers) and their application in design and manufacturing. (9-12 marks)</p>		
		Total marks	80	