

# **Cambridge Technicals Engineering**

## **Unit 2: Application of engineering principles**

Level 2 Cambridge Technical Certificate/Diploma in Engineering  
**05887 - 05888**

## **Mark Scheme for January 2022**

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of candidates of all ages and abilities. OCR qualifications include AS/A Levels, Diplomas, GCSEs, Cambridge Nationals, Cambridge Technicals, Functional Skills, Key Skills, Entry Level qualifications, NVQs and vocational qualifications in areas such as IT, business, languages, teaching/training, administration and secretarial skills.

It is also responsible for developing new specifications to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support, which keep pace with the changing needs of today's society.

This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

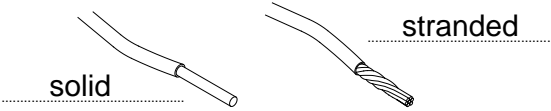
All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

© OCR 2022

Question		Answer	Marks	Guidance
1	(a)	Factors include: E.g. Wear and tear Friction Noise/vibration Thermal heat  <div style="text-align: right;">3 x 1 marks</div>	3	Allow corrosion for wear and tear
1	(b)	$P = 2\pi NT/60$  So $T = 60P/2\pi N$  $= (60 \times 50)/(2\pi \times 250)$  $= \mathbf{1.91 \text{ (Nm)}}$	  1  1  1	Award 3 marks for correct answer with no working  Rearrangement  Substitution  Award 3 marks for correct answer with no working
1	(c)	Efficiency = output power/input power  So output power = efficiency x input power  $= (80/100) \times 120$  $= \mathbf{96 \text{ (W)}}$	  1  1  1	Rearrangement  Substitution  Award 3 marks for correct answer with no working
			<b>9</b>	

Question		Answer	Marks	Guidance														
2	(a)	<table border="1"> <thead> <tr> <th>Property</th> <th>Tick (✓)</th> </tr> </thead> <tbody> <tr> <td>Good conductor</td> <td>✓</td> </tr> <tr> <td>Brittle</td> <td></td> </tr> <tr> <td>High ductility</td> <td>✓</td> </tr> <tr> <td>Smart properties</td> <td></td> </tr> <tr> <td>Malleable</td> <td></td> </tr> <tr> <td>Good resistance to corrosion</td> <td>✓</td> </tr> </tbody> </table>	Property	Tick (✓)	Good conductor	✓	Brittle		High ductility	✓	Smart properties		Malleable		Good resistance to corrosion	✓	3	If 4 selected max 2 marks
Property	Tick (✓)																	
Good conductor	✓																	
Brittle																		
High ductility	✓																	
Smart properties																		
Malleable																		
Good resistance to corrosion	✓																	
2	(b)	<p>Suitable properties will include those in table in 2a and strength, toughness, hardness, machinability, elasticity/plasticity. Also: Relative cost Relative availability Safety in manufacture Standard forms of supply Sustainable use of materials</p> <p style="text-align: right;">3 x 1 marks</p>	3	3 x 1 marks														
2	(c)	<p>Material Removal: 3 x 1 marks <b>Drilling</b> <b>Milling</b> <b>Turning</b></p> <p>Manipulating and Forming: 3 x 1 marks <b>Extrusion</b> <b>Forging</b> <b>Laminating</b></p>	3 3	Accept cutting  Accept injection moulding, folding, bending														
			<b>12</b>															

Question		Answer	Marks	Guidance
3	(a)	<p><b>A</b> – Resistor  <b>B</b> – Voltmeter</p> <p style="text-align: right;">2 x 1 marks</p>	2	
3	(b)	(In light the LDR) resistance is low	2	Award 1 mark for opposite. Award max 2 marks for correct statement referring to part A. (eg Lamp goes brighter/ V reading increases)
3	(c)	<p>LDR applications:                      E.g.                      Street lighting                      Alarm clocks                      Burglar alarm                      Light intensity meters                      Camera shutter control</p> <p style="text-align: right;">3 x 1 marks</p>	3	Accept other correct responses.
3	(d)	 <p style="text-align: right;">2 x 1 marks</p>	2	Award one if reversed (stranded and solid)
3	(e)	<p>AC induction motor applications:                      E.g.                      Water pump                      Boiler pump                      Air conditioners                      Fans                      Cars                      Kitchen appliances                      Lawnmower motor</p> <p style="text-align: right;">3 x 1 marks</p>	3	Accept other correct responses.
			<b>12</b>	

Question		Answer	Marks	Guidance
4	(a)	Power sources: <b>Dynamic Positive displacement</b>  2 x 1 marks	2	
	(b)	(i) A <b>poppet valve</b> has an orifice that is opened and closed by raising and lowering a sealing surface onto the orifice. [1] An internal spring holds the valve in the closed position. [1]	2	Allow marks for any other valid points made.
	(b)	(ii) A <b>Spool valve</b> directs the flow of fluid [1] to and from one port to another port i.e. directional control. [1]	2	Allow marks for any other valid points made.
	(b)	(iii) A <b>rotary valve</b> regulates the flow of a substance from one chamber to another [1] while maintaining a good airlock condition. [1]	2	Allow marks for any other valid points made.
	(c)	(i) Pilot valve applications:  Manual emergency stop valve Pressure relief valve.  2 x 1 marks	2	Allow emergency and safety control example Allow self-acting pressure control valve (used for back pressure, pump reduction and pump bypass) Allow self-contained requiring no external power source.
	(c)	(ii) Check valve applications:  On a pump to ensure no back flow. Fluid feed system Heating system Irrigation system  2 x 1 marks	2	Award 1 mark for each of the following, maximum 2. Safety valve – when a system pressure goes below a pre-set value the check valve operates Acts as a vacuum breaker Used in pumps that supply water to a water slide Essential for keeping liquids in the pipes of a system.
			<b>12</b>	

**OCR (Oxford Cambridge and RSA Examinations)**  
**The Triangle Building**  
**Shaftesbury Road**  
**Cambridge**  
**CB2 8EA**

**OCR Customer Contact Centre**

**Education and Learning**

Telephone: 01223 553998

Facsimile: 01223 552627

Email: [general.qualifications@ocr.org.uk](mailto:general.qualifications@ocr.org.uk)

[www.ocr.org.uk](http://www.ocr.org.uk)

For staff training purposes and as part of our quality assurance programme your call may be recorded or monitored

**Oxford Cambridge and RSA Examinations**  
is a Company Limited by Guarantee  
Registered in England  
Registered Office; The Triangle Building, Shaftesbury Road, Cambridge, CB2 8EA  
Registered Company Number: 3484466  
OCR is an exempt Charity

**OCR (Oxford Cambridge and RSA Examinations)**  
Head office  
Telephone: 01223 552552  
Facsimile: 01223 552553

© OCR 2022

 **Cambridge  
Assessment**

