Cambridge Technicals
Engineering

Unit 2C: Application of engineering principles

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

Mark Scheme for January 2024

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.

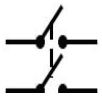
<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>1</td><td>(a)</td><td></td><td>
<table>
<tr><th>Factor</th><th>Tick (✓)</th></tr>
<tr><td>Atmospheric atmosphere</td><td></td></tr>
<tr><td>Capacitance</td><td></td></tr>
<tr><td>Friction</td><td>✓</td></tr>
<tr><td>Rapid prototyping</td><td></td></tr>
<tr><td>Thermal</td><td>✓</td></tr>
<tr><td>Vibration</td><td>✓</td></tr>
<tr><td>Wear and tear</td><td>✓</td></tr>
</table>
</td><td>4
(4x1)</td><td>Award one mark for each correct tick.

Award 0 if there are more than four ticks.</td></tr>
</table>

Question			Answer	Marks	Guidance
1	(b)		Work done = force x distance [1] = 80 x 50 [1] = **4000** [1] **Nm** [1]	**4** (1x4)	Award full marks for a correct answer plus units with no working shown. Accept Joules or J or nm for unit mark.
1	(c)		Efficiency = output power / input power (x 100%)	1	Accept work or energy instead of power. Also accept output/input
			Total	**9**	

Question			Answer	Marks	Guidance
2	(a)		Non-ferrous metals: • Brass • Bronze • Copper • Lead • Tin • Titanium • Zinc	**3** (3x1)	Accept any correct non-ferrous metals Ignore spelling
2	(b)		Acrylonitrile Butadiene Styrene (ABS) or PVC [1] Tungsten Carbide [1] Urea-formaldehyde [1]	**3** (3x1)	 Allow diamond
2	(c)		Drilling is the process of <u>cutting</u> holes in a material using a rotating tool i.e., a drill Material removal (process) Joining process A ***rivet*** consists of a smooth cylindrical shaft with a head on one end. which is used in the process of joining two plates of material (often metal) together using one or more rivets as needed. Heat treatment (process) Quenching is the process of soaking a metal component at / heating a metal to a high temperature followed by (rapid) cooling usually in a liquid (to obtain the required properties in the component.)	**6** (3x2)	Award 1 mark for basic understanding of process or outcome. Needs more detail to score 2nd mark Any 2nd mark for more detail Award 1 mark for basic understanding of process or outcome. Needs more detail to score 2nd mark Award 1 mark for basic understanding of process or outcome. Needs more detail to score 2nd mark. Any 2nd mark for more detail
			Total	**12**	

Question			Answer	Marks	Guidance
3	(a)		A polarised capacitor can only be fitted in one direction in a circuit. The positive lead is longer than the negative one and in some cases the + sign is printed on the capacitor. An unpolarized capacitor can be fitted in any direction – there is no positive and negative.	**2** (1x2)	Note that good answer re either polarised or unpolarised can score both marks
3	(b)	(i)	21000 Ω	**1**	Award one mark for 21,000 or 21,000 Ω or 21 k Ω
3	(b)	(ii)	10%	**1**	Award one mark for 10 or 10%
3	(b)	(iii)	Tolerance = 10% of 150 Ω = 15 (Ω) [1] Minimum = 150 – 15 [1] = 135 (Ω) [1] Maximum = 150 + 15 [1] = 165 (Ω) [1]	**5** (5x1)	Award full marks for correct answers with no working shown If correct maximum and minimum are seen but reversed award 2 marks – so with correct value of tolerance (ie 15 Ω) award 3 marks.

Question			Answer	Marks	Guidance
3	(c)		 Name: Single pole single throw switch/ SPST  Name: Double pole double throw switch/DPDT  Name: Push to make switch (PTM)	3 (3x1)	Award one mark for each correct response
			Total	**12**	

Question			Answer	Marks	Guidance
4	(a)		Dynamic [1] Positive displacement [1]	**2** (2x1)	
4	(b)		A linear single acting actuator works with compressed air to actuate the piston in one direction [1] spring (force) to return in the opposite direction/ to the base position. [1]. A linear double acting actuator has air or liquid supplied to both sides of the piston, with one side at a higher pressure. Two ports This provides the force required to actuate the piston (in both directions). A rotary actuator uses compressed air that pushes against a vane/fin which is attached to a spindle. The pressure on the vane causes it to rotate/move in a circular direction. The air behind the vane is released through a port.	**6** (3x2)	Award 1 mark for basic description For example, (Goes) in a straight line or WTTE is good enough for 1 mark. Further correct detail required for 2 marks Award 1 mark for basic description, for example (Goes) backwards and forwards in a straight line or WTTE is good enough for 1 mark. Further Correct detail required for 2 marks Award 1 mark for basic description, for example (Goes) in a circle or rotates (or WTTE) is good enough for 1 mark. Further Correct detail required for 2 marks
4	(c)		Check [1] Spool [1] Pilot [1] Poppet [1]	**4** (4x1)	
			Total	**12**	

Need to get in touch?

If you ever have any questions about OCR qualifications or services (including administration, logistics and teaching) please feel free to get in touch with our customer support centre.

Call us on

01223 553998

Alternatively, you can email us on

support@ocr.org.uk

For more information visit

ocr.org.uk/qualifications/resource-finder
ocr.org.uk
Twitter/ocrexams
/ocrexams
/company/ocr
/ocrexams

CAMBRIDGE
UNIVERSITY PRESS & ASSESSMENT

OCR is part of Cambridge University Press & Assessment, a department of the University of Cambridge.

OCR operates academic and vocational qualifications regulated by Ofqual, Qualifications Wales and CCEA as listed in their qualifications registers including A Levels, GCSEs, Cambridge Technicals and Cambridge Nationals.

OCR provides resources to help you deliver our qualifications. These resources do not represent any particular teaching method we expect you to use. We update our resources regularly and aim to make sure content is accurate but please check the OCR website so that you have the most up-to-date version. OCR cannot be held responsible for any errors or omissions in these resources.

Though we make every effort to check our resources, there may be contradictions between published support and the specification, so it is important that you always use information in the latest specification. We indicate any specification changes within the document itself, change the version number and provide a summary of the changes. If you do notice a discrepancy between the specification and a resource, please contact us.

Whether you already offer OCR qualifications, are new to OCR or are thinking about switching, you can request more information using our Expression of Interest form.

Please get in touch if you want to discuss the accessibility of resources we offer to support you in delivering our qualifications.