

# **Cambridge Technicals**

## **Engineering**

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

Level 2 Cambridge Technical in Engineering

**05887 - 05888**

### **Mark Scheme for January 2025**

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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.

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Question			Answer	Marks	Guidance
1	(a)	(i)	Torque = force x distance.	1	
1	(a)	(ii)	Newton-metre.	1	Accept Nm
1	(b)		Power = $2\pi NT/60$ (1) $= 2\pi \times 40 \times 30/60$ (1) $= 125.7$ (1) W (1)	4 (1x4)	Allow 0.1257 kW  Answer must have units for all marks to be awarded.
1	(c)		Accept any three from the following losses: <ul style="list-style-type: none"> <li>• Wear</li> <li>• Friction</li> <li>• Noise</li> <li>• Vibration</li> <li>• Thermal.</li> </ul>	3 (3x1)	

Question		Answer	Marks	Guidance
2	(a)	Accept any <b>three</b> from the following considerations: <ul style="list-style-type: none"> <li>• Relative cost of manufacture</li> <li>• Relative availability</li> <li>• Relative cost of material</li> <li>• Safety in manufacture</li> <li>• Standard forms of supply</li> <li>• Sustainable use of materials.</li> </ul>	<b>3</b> (3x1)	. Accept any other correct responses
2	(b)	Non-ferrous materials:  Bronze (1) Copper (1) Tin (1)	<b>3</b> (3x1)	Award no marks for a response with more than 3 ticks
2	(c)	Material Removal: Milling (1) Cutting (1) Turning (1)	<b>3</b> (3x1)	
2	(d)	Welding is a fabrication process (1) where two or more component parts are fused together (1) by means of heat and pressure (1) resulting in a permanent joint as the parts cool. The main sources of heat are: arc, MIG, TIG, plasma and oxyacetylene (1).	<b>3</b> (1x3)	Allow 1 mark for sensible example of welded structure (eg Bike frame)

Question		Answer	Marks	Guidance
3	(a)	Fixed value resistor, fixed resistor or resistor (1) Light Dependent resistor (LDR) (1) Variable resistor (1) Thermistor (1)	4 (4x1)	
3	(b)	A permanent magnet motor has a pair of magnets. (1) The magnets provide the static magnetic field in which the rotor rotates. (1) The rotor consists of a central axle on which are mounted the armature coils. (1) The armature is placed within the magnetic field created by the permanent magnets placed inside the stator. (1) The armature will then rotate according to the force generated. (1). Direction of rotation is governed by the polarity of the connecting wires. (1)	5 (1x5)	
3	(c)	A simple fuse contains a piece of wire that melts easily. (1) When the current going through the fuse exceeds its rated value, (1) the wire heats up until it melts and breaks the circuit. (1) The rating of the fuse is chosen to be just above the maximum current drawn by the appliance. (1)	3 (1x3)	

Question		Answer	Marks	Guidance
4	(a)	<p>A linear double-acting cylinder has a port at each end of the cylinder. (1)</p> <p>The piston moves forward and backwards (1) by alternating the port that receives the high-pressure air or oil. (1)</p> <p>This is necessary when a load must be moved in both directions. (1)</p> <p>Air or oil pressure is applied alternately to the opposite ends of the piston. (1)</p>	<p><b>5</b> (1x5)</p>	
	(b)	<p>Applications:</p> <ul style="list-style-type: none"> <li>• Lifts.</li> <li>• Forklift trucks</li> <li>• Car suspension systems</li> <li>• Landing gear in aircraft</li> <li>• Drilling.</li> <li>• Earth-moving equipment.</li> <li>• Log-splitters.</li> <li>• Car transport carriers</li> <li>• Control of movement in two directions</li> </ul>	<p><b>3</b> (3x1)</p>	Accept any other correct responses.
4	(c)	<p>A check valve allows flow of fluid in one direction (1) but resists fluid flow in the other direction. (1)</p>	<p><b>2</b> (1x2)</p>	

Question		Answer	Marks	Guidance
4	(d)	Applications: <ul style="list-style-type: none"><li>• Shower hand spray</li><li>• Kitchen spray</li><li>• Water meters</li><li>• Pumping systems</li><li>• Solenoid valve at the inlet of an appliance</li><li>• Booster pumps</li><li>• Irrigation systems</li><li>• Heating systems</li></ul>	2 (2x1)	Accept any other correct responses.

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