

Cambridge Technicals Engineering

Unit 2: Application of engineering principles

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

Mark Scheme for January 2020

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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)	Friction Vibration Wear and tear	3	Award one mark for each correct response. Allow lubrication.
	(b)	$T = 60 P/2N\pi$ $= (60 \times 800)/(2 \times 400 \times \pi)$ $= 19.1 \text{ Nm}$	3	Award one mark for $T = 60 P/2N\pi$ OR $800/400$ Award one mark for correct numerical value 19.1 OR $(60 \times 800)/(2 \times 400 \times \pi)$ Award one mark for unit Nm.
	(c)	Power = (force x distance)/time $= (400 \times 3)/(4 \times 60)$ $= 5 \text{ W}$	3	Award one mark for Power = (force x distance)/time OR $400 \times 3 \div 4$ Award one mark for $(400 \times 3)/(4 \times 60)$ OR correct numerical value of 5. Award one mark for unit W.

Question			Answer	Marks	Guidance
2	(a)	(i)	Properties: Light Corrosion resistant / rustproof Strong Shock resistant Remain bright and shiny after time/aesthetic High wear resistance High strength	3	Award one mark for each correct property up to a maximum of three. Accept other correct responses. Allow durability.
	(a)	(ii)	Process: Forging	1	Award one mark for the correct process.
	(a)	(iii)	Process: Drilling Or punching (blanking)	1	Award one mark for the correct process.
	(a)	(iv)	Process: Threaded fastening Using a screw/nut and bolt	2	Award one mark for threaded fastening. Award one mark for a screw or nut and bolt.
	(b)		<i>Injection moulding</i> is a manufacturing process for producing parts by injecting molten material into a <i>mould</i>	2	Award one mark for reference to 'for producing parts by injecting molten material, and one mark for 'into a <i>mould</i> '. <i>Allow melting/ melted instead of molten. Award 1 mark for reference to polymers/plastics.</i> Maximum 2 marks

Question		Answer	Marks	Guidance
	(c)	<p>Copper is used in electric cable because of its good <u>conductivity</u>.</p> <p>Cast iron is used for the base of a machine because of its <u>toughness</u>. (allow strength)</p> <p>Tungsten carbide is used for cutting tool tips because of <u>hardness</u> (allow strength)</p>	3	Award one mark for each correct response for each material.

Question		Answer	Marks	Guidance
3	(a)	Instrument 1 – Ammeter measuring (total) current Instrument 2 – Voltmeter measuring (cell) e.m.f OR (supply)voltage Instrument 3 – Ammeter measuring current (through resistor R_1)	6	Award one mark for each correct instrument. Award one mark for each correct quantity.
	(b)	Resistor Variable resistor/potentiometer/rheostat	2	Award one mark for each correct component.
	(c)	(Change in) temperature (causes change in) resistance (or wtte) Increase in T causes decrease in resistance (or wtte) Applications: Temperature measurement Fire detection Burglar alarms Refrigeration temperature control Compensation in motor windings Industrial process control Emission control	1 1 2	Award one mark for each correct application up to a maximum of two. Accept other correct responses. Allow applications seen anywhere in response.

Question		Answer	Marks	Guidance
4	(a)	Positive displacement Fixed displacement Variable placement	2	Award one mark for each correct hydraulic power source named up to a maximum of two.
	(b)	<p>Single acting cylinder. Application: Positioning of packages Clamping Assembly operation Movement of goods to conveyor belts car hoist car jack</p> <p>Double acting cylinder. Application: Opening and closing of train doors Lifting and placing of goods Landing gear suppression Earth moving equipment Fork lift trucks robot arm control mechanism excavator bucket arm movement Scrap yard crushers</p>	4	<p>Award one mark for each correct application of a SAC up to a maximum of two.</p> <p>Award one mark for each correct application of a DAC up to a maximum of two.</p> <p>Accept other correct responses.</p>

Question		Answer	Marks	Guidance
(c)	(i)	<p>Directional control valves <u>allow fluid flow into different paths</u> from <u>one or more sources</u>.</p> <p>They usually consist of <u>a spool inside a cylinder</u> which is <u>mechanically or electrically controlled</u>.</p> <p>The movement of the spool <u>restricts</u> or <u>permits the flow</u>, thus it controls the fluid flow.</p>	4	<p>Award one mark for each correct point made up to a maximum of four.</p> <p>Accept other correct responses.</p>
(c)	(ii)	<p>Spool valve applications:</p> <ul style="list-style-type: none"> Automatic transmissions Hydraulic elevators Unloading of a fixed-displacement pump Cylinder regeneration Two-speed motor (or cylinder) operation Control of a single-acting cylinder, clutch, or brake. Circuit selector Pilot control for a large directional spool. 	2	<p>Award one mark for each correct application up to a maximum of two.</p> <p>Accept other correct responses.</p>

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 **Cambridge
Assessment**

