Cambridge Technicals
Engineering

Unit 2C: Application of engineering principles

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

Mark Scheme for June 2023

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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.

Question			Answer	Marks	Guidance
1	(a)		Wear Noise/vibration Thermal/heat 3 x 1 mark	3	Allow (lack of) lubrication
1	(b)		T = (60 x P)/ 2πN [1] = (60 x 200)/(2π x 40) [1] = 47.747 [1] Nm [1] 4 x 1 mark	4	200/40 scores 1 200 x 60 OR 2 x x 40 scores 1 48 scores 3 marks
1	(c)		Friction Vibration (noise) Components weight not distributed evenly. 2 x 1 mark	2	

Question			Answer	Marks	Guidance
2	(a)		Properties of carbon fibre: • Lightweight [1] • Corrosion resistant [1] • High compressive strength [1] • Chemically stable [1] 4 x 1 mark	4	Maximum two marks for any who add ticks to more than 4 rows. No marks if all boxes are ticked.
2	(b)		Benefits of using standard parts: • Less expensive than having to manufacture special sizes. [1] • Usually readily available because they are processed in large quantities. [1]	2	Accept any other correct response.
2	(c)		Material processing techniques:		
		(i)	Turning is the removal of metal from the outer diameter of a rotating cylindrical workpiece, [1] usually to a specified dimension, and to produce a smooth finish on the metal. [1]	2	Lathe scores 1 Fixed cutting tool scores 1 Rotating work piece/ chuck scores 1 Max 2
		(ii)	Forging involves the shaping of a metal through hammering, pressing, or rolling.[1] The original metal is plastically deformed to the wanted geometrical shape. [1]	2	
		(iii)	Sintering is the process of fusing particles together into one solid mass by using a combination of pressure and heat [1] without melting the materials. [1]	2	

Question			Answer	Marks	Guidance
3	(a)		Components: • Resistor [1] • Light dependant resistor (LDR) [1] • Variable resistor [1] • Thermistor [1] 4 x 1 mark	4	
	(b)	(i)	Fuse A fuse is designed to melt and separate into two pieces [1] for the purpose of breaking a circuit in the event of excessive current. [1]	2	Accept blow for melt Accept stop current flow for break circuit
		(ii)	Diode A diode is a device that acts as a one-way switch for current. It allows current to flow easily in one direction, but severely restricts current from flowing in the opposite direction. [1] A diode is used to block this reverse current flow which helps to protect components in circuits that can be damaged from reverse current. [1]	2	
		(iii)	Residual Current device (RCD) A RCD protects a circuit or person by tripping out (i.e. switches off) when a fault is detected. [1] When the flow between each type of wiring is equal, the RCD will allow the electric current to flow as normal. When an imbalance is detected, the RCD will stop the flow of electric current. [1]	2	

Question			Answer	Marks	Guidance
3	(c)		Test equipment: • Power supply unit • Multimeter • Voltmeter • Ammeter • Ohmmeter Any 2 x 1 mark	2	Accept logic probe even though it is not in the specification. Accept (light) bulb

Question			Answer	Marks	Guidance
4	(a)	(i)	A positive-displacement pump operates on a series of working cycles. [1] Each cycle moves a fixed amount of fluid mechanically through the pump. [1] There is little or no influence from the back pressure on the pump. [1] 3 x 1 mark	3	Not just flows in one direction
4	(a)	(ii)	A pneumatic dynamic pump uses compressed air to create force that is used to move fluids through a piping system [1] The dynamic centrifugal pump is a mechanical device designed to move a fluid by means of the transfer of rotational energy from one or more driven rotors, called impellers. [1] Fluid enters the rapidly rotating impeller along its axis and is cast out by centrifugal force along its circumference through the impeller's vane tips.[1] 3 x 1 mark	3	Not just flows in one direction
4	(b)		Rotary actuator applications: • Operate pipeline valves • Dams • Pick and place • Packaging • Sluice gates • Clamping • Air core gauges Any 3 x 1 mark	3	Accept other correct responses.

Question			Answer	Marks	Guidance
4	(c)		Directional [1] Sliding [1] Permits [1] 3 x 1 mark	3	

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