

Surname	Centre Number	Candidate Number
First name(s)		2



GCE A LEVEL

1601U30-1



S25-1601U30-1

MONDAY, 2 JUNE 2025 – MORNING

DESIGN AND TECHNOLOGY – A2 unit 3

Engineering Design

2 hours 30 minutes

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	8	
2.	8	
3.	8	
4.	8	
5.	12	
6.	12	
7.	12	
8.	12	
9.	10	
10.	10	
Total	100	

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ADDITIONAL MATERIALS

A calculator, ruler, pencil and coloured pencils.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen. Do not use gel pen or correction fluid.

You may use a pencil for graphs and diagrams only.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet. If you run out of space, use the additional page(s) at the back of the booklet, taking care to number the question(s) correctly.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question. You are advised to divide your time accordingly.

The total number of marks available is 100.

You are reminded of the need for good English and orderly, clear presentation in your answers.

The quality of your written communication, including appropriate use of punctuation and grammar, will be assessed in your answer to question **10**.



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Answer **all** questions.

1. The picture below shows an outdoor children's climbing frame.



- (a) Explain why powder coating is an appropriate finish for the climbing frame. [5]

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- (b) Name a polymer that can be used to manufacture the ropes on the climbing frame, and explain why this is a suitable material. [3]

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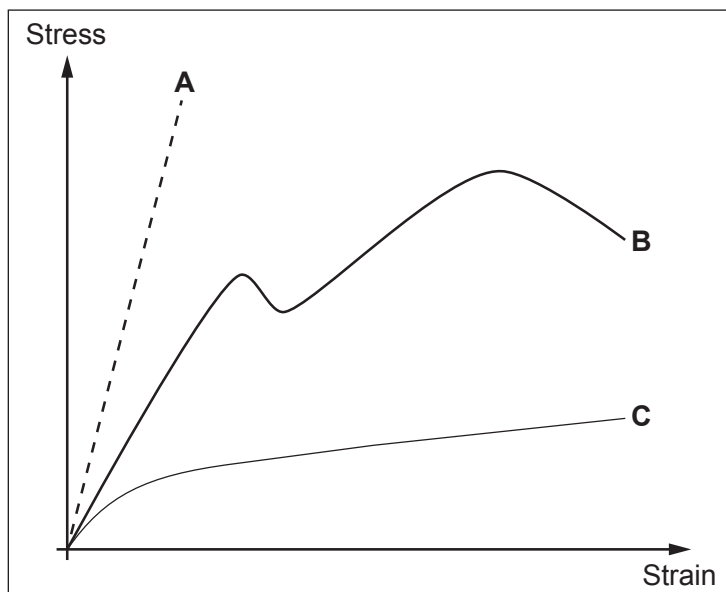
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2. The graph below shows the stress–strain curves for three common materials.



(a) (i) State which material is the most plastic. [1]

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(ii) State which material is the most ductile. [1]

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(iii) State which material is the most brittle. [1]

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(b) Explain the difference between the elastic and plastic states when a material is being stressed. [5]

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3. The picture below shows a modern bicycle frame which has been manufactured from carbon fibre reinforced polymer (CFRP) using the 'lay-up' process.



- (a) Describe the advantages of manufacturing the bicycle frame using CFRP. [5]

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- (b) Describe how production and planning systems are used to improve efficiency during the manufacture of bicycles. [3]

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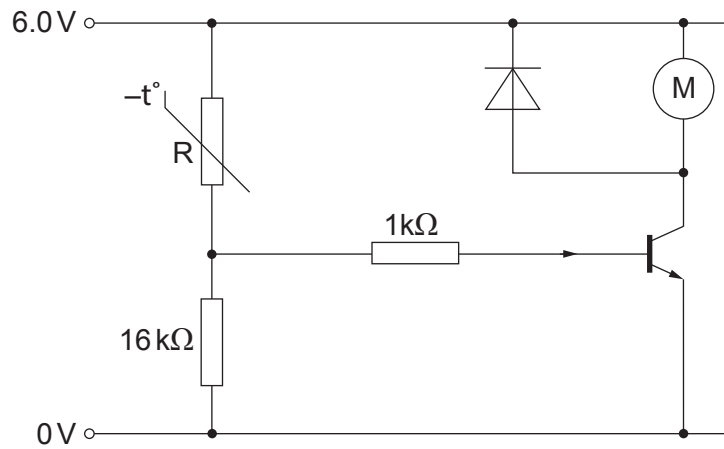


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4. A desktop fan with a possible circuit to control its operation is shown below.



- (a) Explain how the circuit functions as the temperature of the room changes.

[4]

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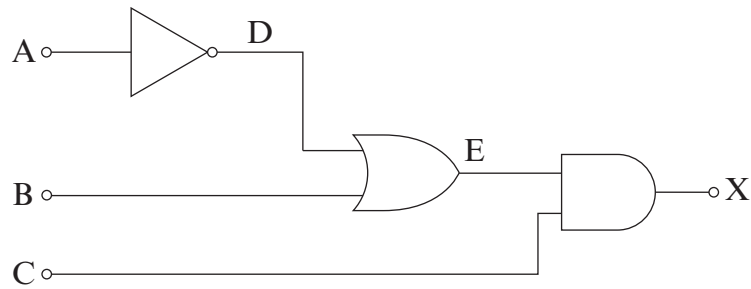
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(b) The logic diagram below is an alternative solution for controlling the fan.



Complete the truth table for the logic diagram.

[4]

A	B	C	D	E	X
0	0	0	.....	.....	.....
0	0	1	.....	.....	.....
0	1	0	.....	.....	.....
0	1	1	.....	.....	.....
1	0	0	.....	.....	.....
1	0	1	.....	.....	.....
1	1	0	.....	.....	.....
1	1	1	.....	.....	.....



5. Portable electronic products such as the tablet shown below are constantly changing as technology advances. To some, this type of product could be viewed as fulfilling a 'need' in the market, while others may view this product as satisfying a 'want' in the market.



- (a) Distinguish between 'needs' and 'wants' when considering the role of products in current markets.

[3]

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- (b) Explain how **one** specific named market research strategy can be used in product development.

[3]

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- (c) Other than Computer Aided Design (CAD) and Computer Aided Manufacture (CAM), describe how ICT can be used in the manufacturing of engineered products. [2]

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- (d) Discuss the reasons why portable electronic products become obsolete. [4]

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6. The picture below shows a remote control unit.



- (a) Describe the benefits of using rapid prototyping in the development of the remote control. [2]

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- (b) Explain how designers have considered anthropometric and ergonomic factors in the development of the remote control. [6]

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- (c) The casing for the remote control is manufactured by injection moulding. The mould requires a draft angle.

(i) Explain the purpose of a draft angle.

[2]

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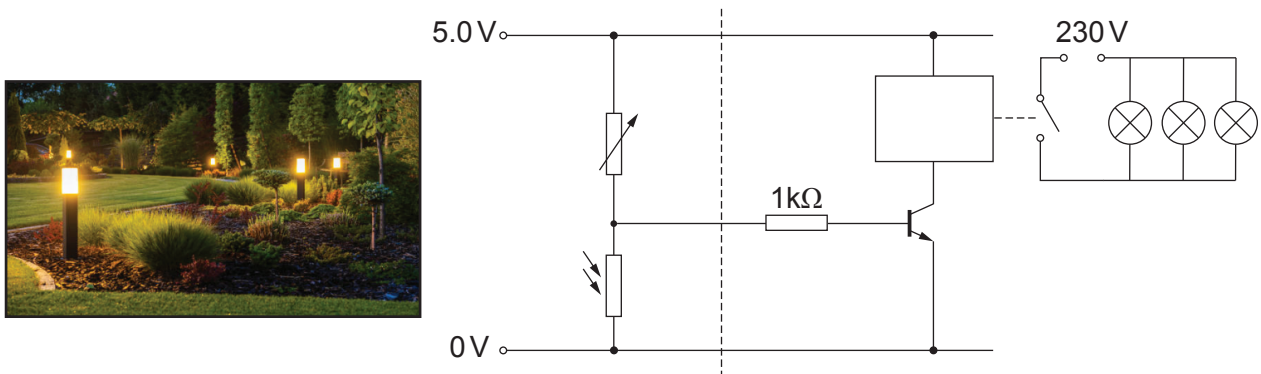
- (ii) Give **two** reasons why injection moulding is a suitable process to manufacture the remote control casing.

Reason 1: [1]

Reason 2: [1]



7. An automatic lighting system with a possible circuit diagram is shown below.



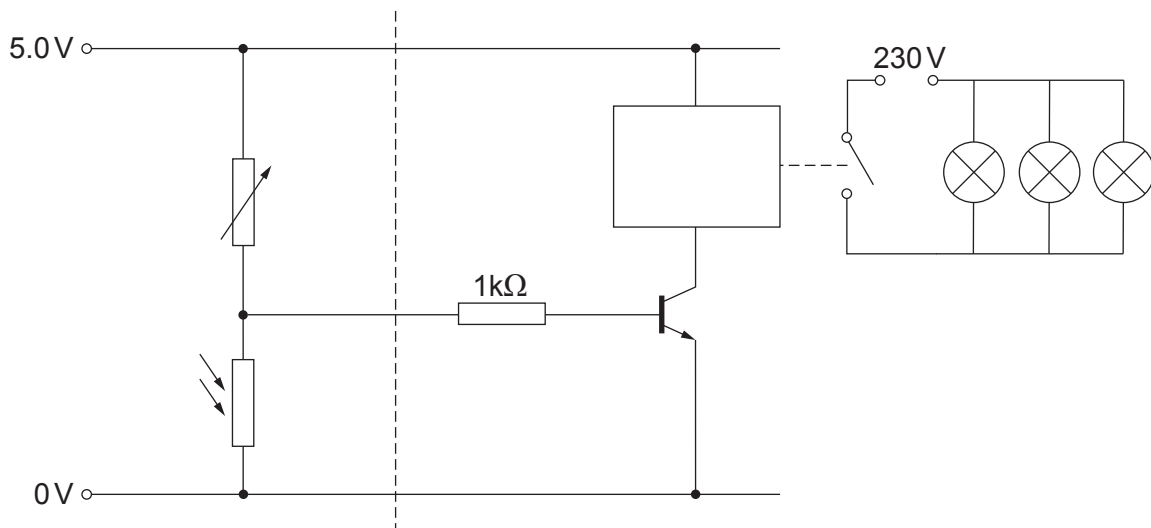
- (a) Describe an advantage of connecting the lamps in parallel instead of in series. [2]

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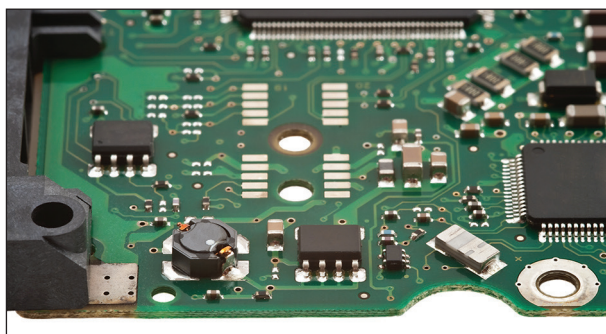
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- (b) On the diagram below, add a diode that will act to protect the transistor. [2]



- (c) The image below shows a commercially produced circuit board where components are positioned using automation and fixed using reflow soldering.



Surface mount technology

Explain the advantages to the manufacturer of using these techniques.

[8]

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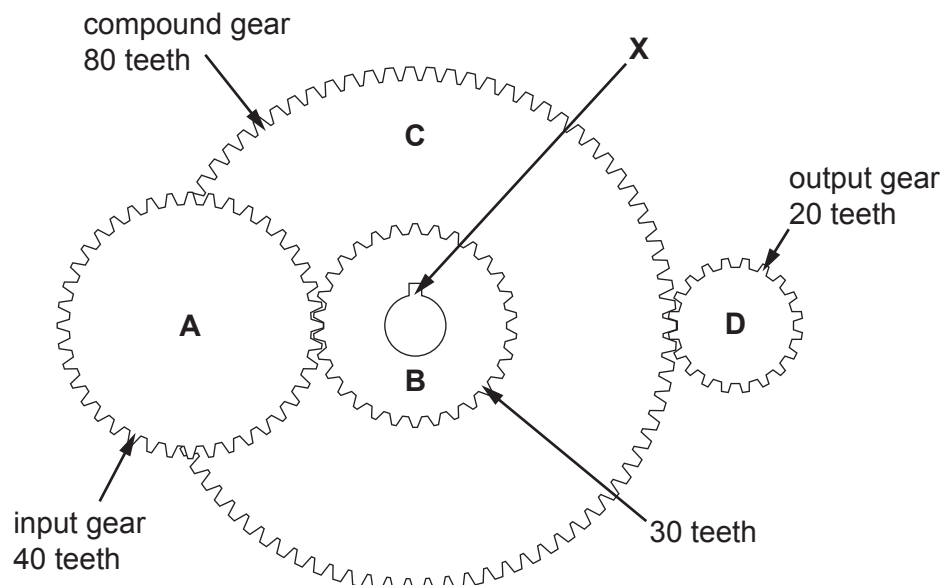
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8. The figure below shows a diagram of a compound gear train.



- (a) (i) The input gear rotates at a speed of 90 rpm.
Calculate the speed of the output gear.

[3]

Show all workings.

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- (ii) Name the feature shown as **X** on the diagram and state its purpose.

[2]

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- (iii) Describe the reasons why bevel gears are sometimes used when designing mechanical systems.

[2]

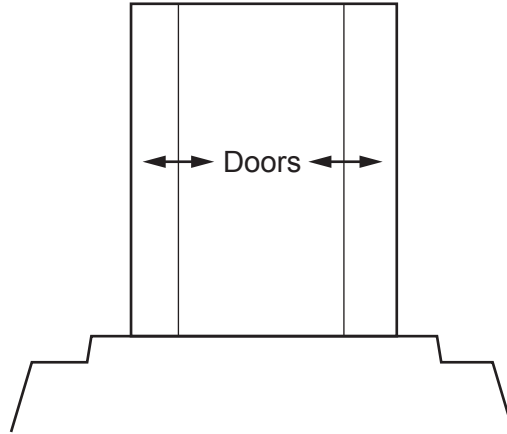
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- (b) The image below shows an elevator (lift) with electrically operated sliding doors that are commonly used in multi-storey buildings. In the event of an emergency, a mechanical backup is needed in order to open the doors.



In the space below, design a mechanical system that can be used to open the doors in the event of an electrical failure. Add all explanatory notes and labels. Marks will be awarded for:

- Selection of an appropriate system. [1 mark]
- Clear illustration. [2 marks]
- Explanatory notes and labels. [2 marks]

[5]



- Analyse this quote and consider how this can apply to cradle-to-grave and cradle-to-cradle philosophies. [

[10]



- Marks will be awarded for the content of the answer and the quality of written communication. [10]



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