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Wednesday 10 January 2018 – Morning**LEVEL 1/2 CAMBRIDGE NATIONAL AWARD/CERTIFICATE IN
PRINCIPLES IN ENGINEERING AND ENGINEERING BUSINESS****R101/01** Engineering principles

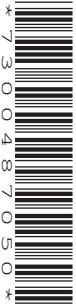
Candidates answer on the Question Paper.

OCR supplied materials:

None

Other materials required:

- A calculator may be used

Duration: 1 hour

Candidate forename		Candidate surname	
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Centre number						Candidate number				
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INSTRUCTIONS TO CANDIDATES

- Use black ink. HB pencil may be used for graphs and diagrams only.
- Complete the boxes above with your name, centre number and candidate number.
- Answer **all** the questions.
- Write your answer to each question in the space provided. If additional space is required, you should use the lined page(s) at the end of this booklet. The question number(s) must be clearly shown.
- Do **not** write in the barcodes.

INFORMATION FOR CANDIDATES

- The total number of marks for this paper is **60**.
- The number of marks for each question is given in brackets [] at the end of each question or part question.
- Dimensions are in millimetres unless stated otherwise.
- Your quality of written communication will be assessed in questions marked with an asterisk (*).
- This document consists of **12** pages. Any blank pages are indicated.

2

Answer **all** the questions.

1 Fig. 1 shows a lever mechanism.

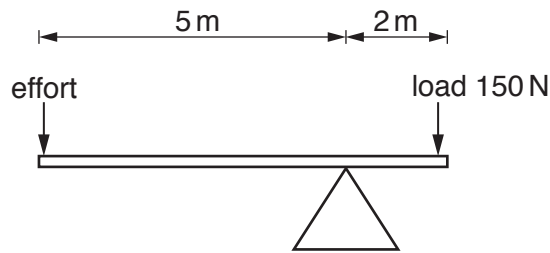


Fig. 1

(a) (i) Add a label to Fig. 1 to show the position of the fulcrum. [1]

(ii) Calculate the right hand moment of the lever mechanism.

..... [1]

(iii) State the effect on the effort required to move the load if the distance between the fulcrum and load is increased.

..... [1]

(b) Give **one** other method of moving a load that will give a mechanical advantage.

..... [1]

(c) A list of different types of power source used to transmit power in engineering is given below.

Mechanical
Electrical
Pneumatic
Hydraulic
Vacuum

Choose **two** power sources from the list and describe **one** example of an application for each power source.

An example is given below.

Power source *Mechanical*

Example *A gear box is mechanically driven and used to transmit power to the wheels at the correct ratio.*

Power source

Example

.....

..... [2]

Power source.....

Example

.....

..... [2]

(d) Using the given example of a gearbox from (c) describe how the output is produced.

.....

.....

.....

..... [2]

2 (a) A rollercoaster takes 2.5 seconds to travel along 70m of track at a constant speed.
Calculate the speed of the rollercoaster.
Use the formula $\text{velocity} = \text{distance}/\text{time}$. State the units in your answer.

.....

.....

..... [2]

- (b) Fig. 2 shows a pneumatic braking system for the rollercoaster. Pressure is applied by component **A** to the friction plates to slow the rollercoaster using friction.

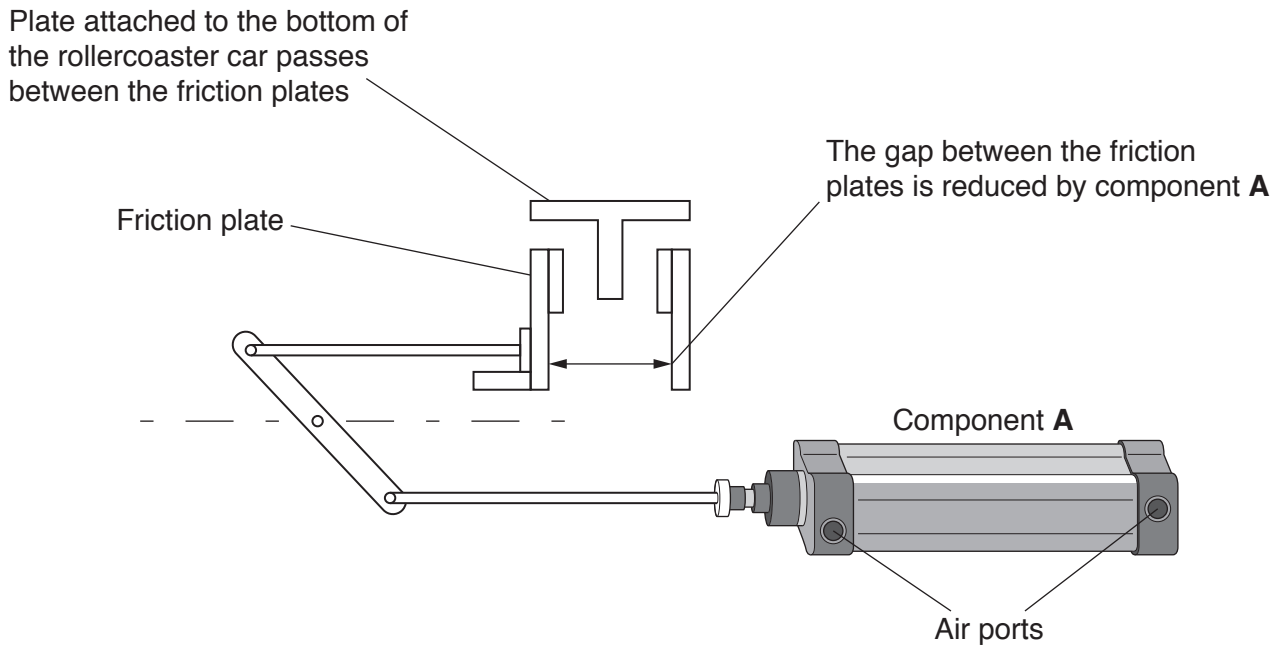


Fig. 2

- (i) State **two** forms of energy that will be produced during the braking process.

1

2 [2]

- (ii) Name component **A**.

..... [1]

- (iii) Fig. 3 shows three circuit symbols for pneumatic components.

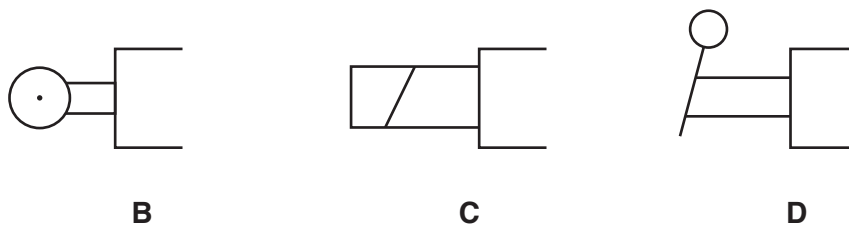


Fig. 3

State which component from the selection above could be used to apply the brakes:

Manually [1]

Automatically [1]

(iv) Describe a system that could be used to apply the brakes to the rollercoaster automatically.

.....

.....

.....

..... [3]

3 (a) Fig. 4 shows a mechanism used on a bicycle.

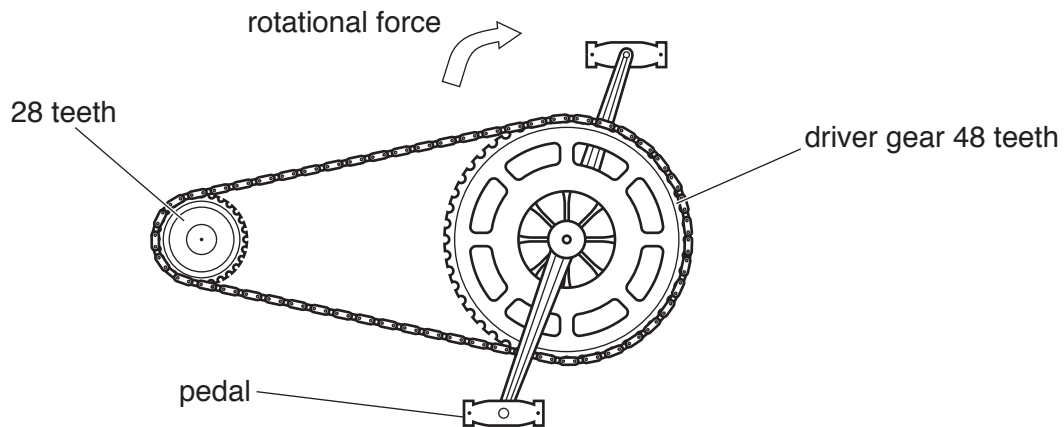


Fig. 4

(i) State the name of the rotational force when the pedals are operated.

..... [1]

(ii) Calculate the velocity ratio for the mechanism.

.....

..... [2]

(iii) Describe the effect of increasing the number of teeth on the driven gear.

.....

..... [2]

(iv) Give **two** other applications that use a geared chain drive.

1

2

[2]

- (b) Explain the advantages of using geared chain drive mechanisms compared to other mechanisms.

.....

.....

..... [3]

- 4 (a) Fig. 5 shows a device used to provide power to a bicycle lamp.

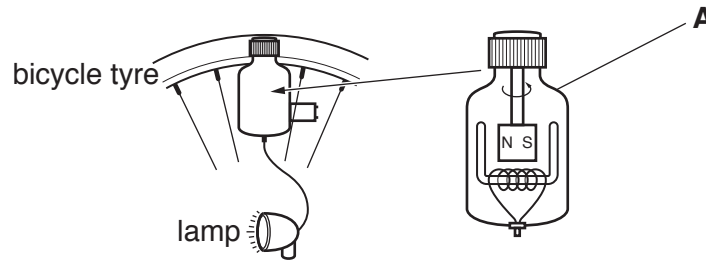


Fig. 5

- (i) Give the name of device A.

..... [1]

- (ii) State the energy conversion that takes place to produce light.

..... to [2]

- (b) (i) Describe how the device in Fig. 5 is able to produce light, naming key parts.

.....

.....

.....

..... [3]

- (ii) Give **one** advantage and **one** disadvantage of using this type of energy source to provide power to the lamp.

Advantage

..... [1]

Disadvantage

..... [1]

- (iii) Device **A** produces 12V to power the 6W bicycle lamp.
Use Ohm's law to calculate the current in the bicycle lamp circuit.

.....

 [2]

- 5 Fig. 6 shows a 5/2 valve used in a fluid power system.

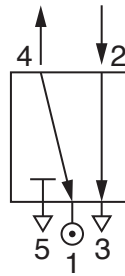


Fig. 6

- (a) Explain what is meant by '5/2'.

.....

 [3]

- (b) Describe the operation of the valve when the valve is used to outstroke an actuator piston.

.....

 [3]

- (c) (i) Add a label **to** the diagram in Fig. 6 to show the exhaust ports on the 5/2 valve. [1]

- (ii) State where the exhaust air is released to in a pneumatic system.

..... [1]

- (iii) Describe how this is different in a hydraulic system.

.....

 [2]

6 Fig. 7 shows a battery holder used in a radio.

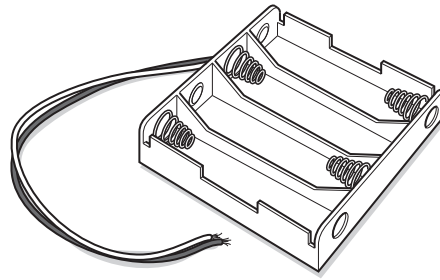


Fig. 7

(a) (i) Explain how the use of more than one battery cell can provide sustained power to the radio.

.....
.....
.....
..... [3]

(ii) Give **one** alternative method for providing power for the radio.

..... [1]

9

(b)* Discuss how different types of power supply impact on the portability of electrical equipment.

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..... [6]

END OF QUESTION PAPER

ADDITIONAL ANSWER SPACE

If additional space is required, you should use the following lined page(s). The question number(s) must be clearly shown in the margin(s).

A large area of lined paper for writing answers. It features a vertical margin line on the left side and horizontal dotted lines for writing. The lines are evenly spaced and extend across the width of the page.

A writing template consisting of a vertical solid line on the left side, creating a margin. To the right of this line, there are 25 horizontal dotted lines spaced evenly down the page, providing a guide for handwriting.

A large area of the page is reserved for writing, featuring a vertical solid line on the left side and horizontal dotted lines extending across the page.



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