OCR
Oxford Cambridge and RSA

Wednesday 9 January 2019 – Morning

LEVEL 1/2 CAMBRIDGE NATIONAL AWARD/CERTIFICATE IN PRINCIPLES IN ENGINEERING AND ENGINEERING BUSINESS

R101/01 Engineering principles

7603911753

Candidates answer on the Question Paper.

OCR supplied materials:
None

Other materials required:
- A calculator may be used

Duration: 1 hour

R101011

Candidate forename		Candidate surname	

Centre number						Candidate number				

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.

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Answer **all** the questions.

1 Fig. 1 shows a hammer used as a lever.

(a) (i) Add **two** labels **to** Fig. 1 to show the position of the Effort and the position of the Load. **[2]**

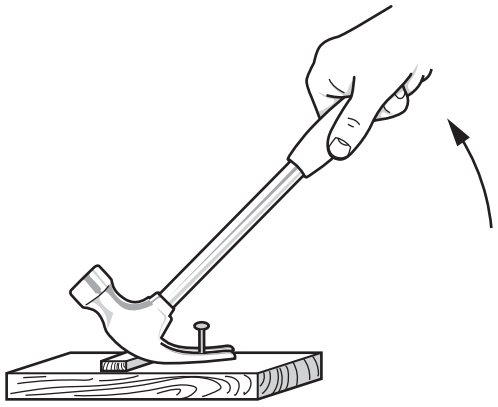

Fig. 1

(ii) State the class of lever represented by the hammer being used in Fig. 1.

..... **[1]**

(iii) Give **two** ways to improve the efficiency when using a hammer to remove nails as shown in Fig. 1.

1 .....

2 .....
[2]

(iv) Explain how the hammer used as a lever is different to a wheelbarrow used to carry a load.

.....

.....

..... **[2]**

(b) (i) Explain what is meant by the term 'mechanical advantage'.

.....

.....

..... **[2]**

(ii) Give **one** application, other than a hammer, of a hand tool used to give mechanical advantage.

..... **[1]**

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2 **(a)** Fig. 2 shows a direct current (DC) electro–mechanical relay.

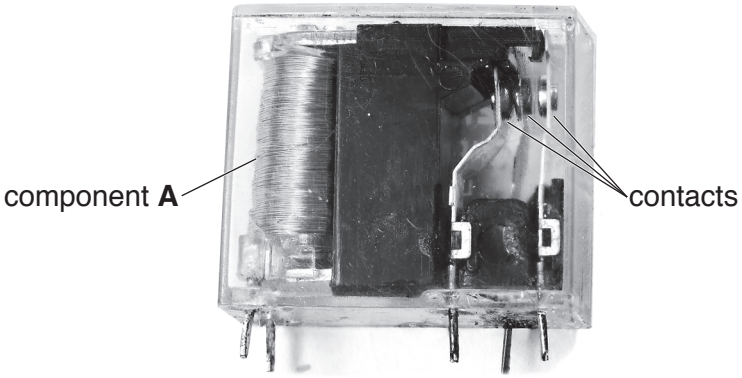

Fig. 2

(i) Name component **A** shown in Fig. 2.

..... **[1]**

(ii) Component **A** has an operating voltage of 12 V and a resistance of 60 ohms. Calculate the current draw of component **A**. State the unit in your answer.

.....

.....

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

(iii) Explain what happens when a current is applied to component **A**.

.....

.....

.....

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

(iv) Give **two** reasons why the device shown in Fig. 2 would be used in a circuit.

1 .....

2 .....

[2]

(v) Name **one** other DC electro–mechanical device.

..... **[1]**

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3 **(a)** Fig. 3 shows a vacuum generator.

(i) Add **one** label **to** Fig. 3 to show the intake port. **[1]**

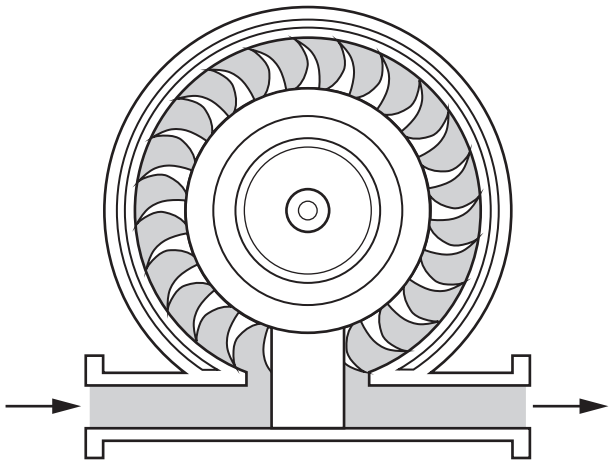

Fig. 3

(ii) Use the terms below to complete the statement describing the operation of the vacuum generator.

Suction **ambient air pressure** **friction** **pressure drop**

The pressure outside the vacuum is the ..... .

The turning fan creates a ..... in the area behind the fan, below the pressure level outside the vacuum generator. This creates ..... and a partial vacuum, inside the vacuum generator. **[3]**

(b) Describe how a vacuum power source could be used in manufacturing, other than for cleaning.

.....

.....

.....

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

(c) Give **two** benefits of using vacuum power in food manufacturing.

1 .....

2 .....

[2]

(d) Name **one** other power source used in engineering.

..... **[1]**

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4 Fig. 4 shows a gear train.

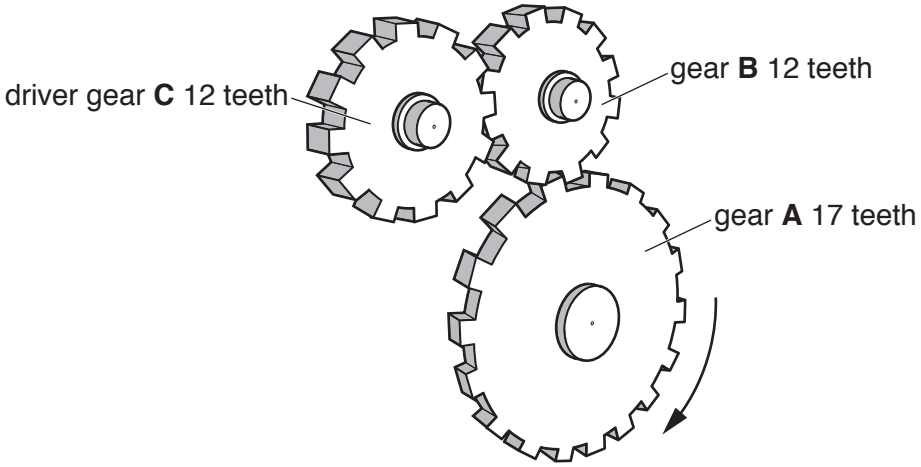

Fig. 4

(a) (i) State which gear, **A**, **B** or **C**, in Fig. 4 is the idler gear.

..... **[1]**

(ii) State the purpose of the idler gear used in this example.

..... **[1]**

(iii) Calculate the velocity ratio of the gear train in Fig. 4.

.....

.....

..... **[2]**

(b) (i) State what is meant by the term 'compound gear'.

..... **[1]**

(ii) Give **one** application that could use compound gears.

..... **[1]**

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(c) Fig. 5 shows a gearbox for a toy car driven by a direct current (DC) motor using a worm gear.

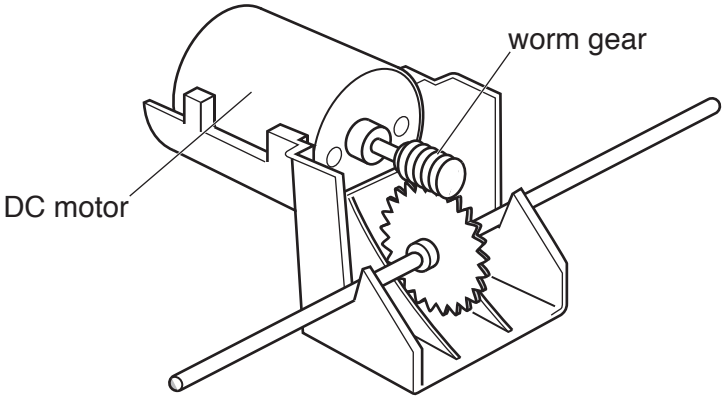

Fig. 5

(i) Give **one** advantage of using this arrangement to make the toy car move.

..... **[1]**

(ii) State the energy conversion that takes place to make the toy car move.

..... to ..... **[2]**

(iii) State how the direction of the motor can be reversed.

..... **[1]**

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5 Fig. 6 shows a pneumatic door system used on a bus.

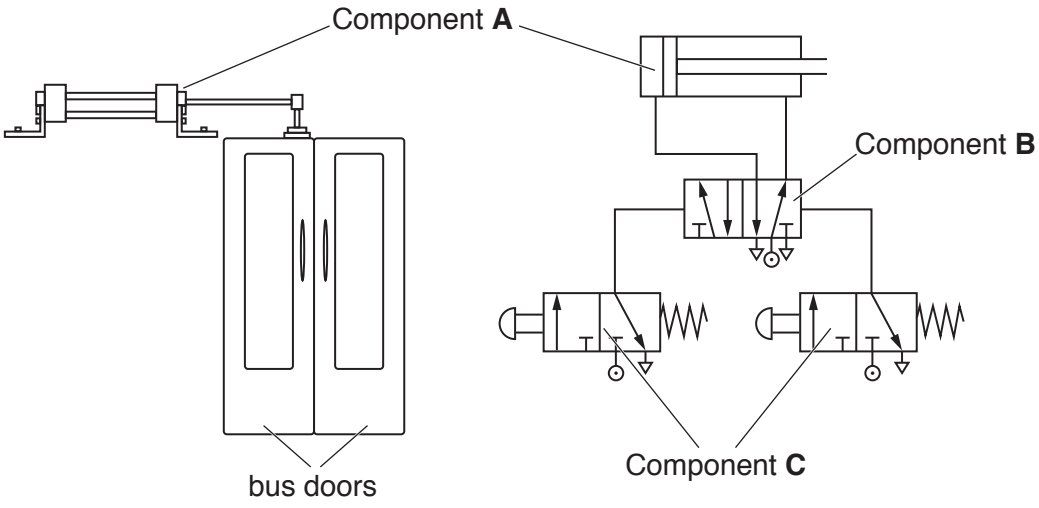

Fig. 6

(a) (i) Name components **A** and **C**.

A .....

C .....

[2]

(ii) Explain how components **B** and **C** are used to control the operation of the door.

.....

.....

.....

.....

..... **[4]**

(iii) Explain why component **A** does not use a return spring.

.....

.....

..... **[2]**

(iv) Give the meaning of the term 'main air'.

.....

..... **[1]**

(v) Add **one** label **to** the pneumatic circuit in Fig. 6 to show **one** of the main air ports. **[1]**

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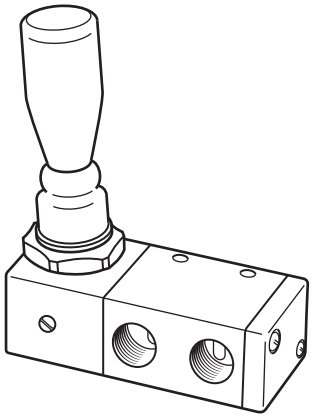
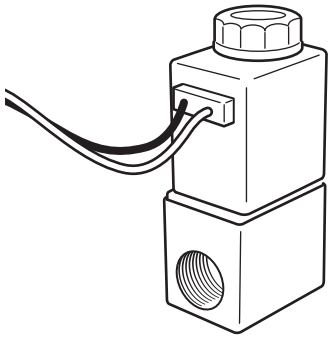
6 Fig. 7 shows two components used to control flow in fluid power systems.



Component **A**



Component **B**

Fig. 7

(a) (i) State the method of operation each of the components uses to control flow.

Component **A** .....

Component **B** .....

[2]

(ii) Give **one** hydraulic application that could use component **A**.

..... **[1]**

(iii) Name **one** component that could be used to control component **B**.

..... **[1]**

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(b)* Discuss the benefits of using electrical systems to control pneumatic applications in engineering.

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..... **[6]**

END OF QUESTION PAPER

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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).

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