

OCR

Oxford Cambridge and RSA

Friday 25 May 2018 – Afternoon**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. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- 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 the 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.

Answer **all** the questions.

1 Fig. 1 shows a filament lamp.



Fig. 1

(a) (i) Complete the statement below.

The lamp converts energy to energy. [2]

(ii) Give **one** other form of energy produced by the lamp when a current is applied.

..... [1]

(b) (i) A kettle is connected to a 230 VAC supply and has a power rating of 1.8 kW.
Calculate the current used.
Use the formula $I = P/V$

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

(ii) Explain what is meant by the term Alternating Current (AC).

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

(iii) Give **one** other example of a product that uses AC.

..... [1]

(iv) State **one** disadvantage of using AC as a power source.

..... [1]

3

2 (a) A loaded pallet resting on the ground is an example of a static body (load).

(i) Give **one** example of a moving load.

..... [1]

(ii) State the name for the unit of force.

..... [1]

(b) (i) A loaded pallet with a force of 780 N is to be lifted 1.5 m onto a truck.
Calculate the work done showing the units.
Use the formula work done = force \times distance.

.....

..... [2]

(ii) Give **one** way to reduce the amount of work done.

..... [1]

(c) Fig. 2 shows a stapler.

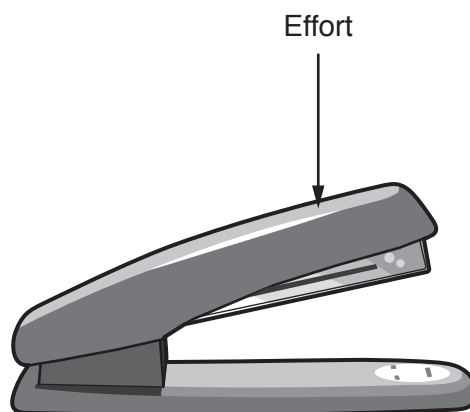


Fig. 2

(i) State the class of lever represented by the stapler.

..... [1]

(ii) Add labels to the stapler in Fig. 2 to show the position of the **load** and **fulcrum**.

[2]

4

- (iii) Place a tick (✓) next to the statement below that gives the correct description of the stapler operating as a machine.

The stapler gives no advantage or disadvantage to the user.

The stapler gives a mechanical advantage to the user.

The stapler gives a mechanical disadvantage to the user. [1]

- (iv) The stapler is capable of stapling 5 pieces of paper, each being 80 grams per square metre (gsm).

State what is meant by the term 'grams'.

..... [1]

- 3 Fig. 3 shows a circuit using two lamps. If one lamp fails, the other lamp will also fail to light.

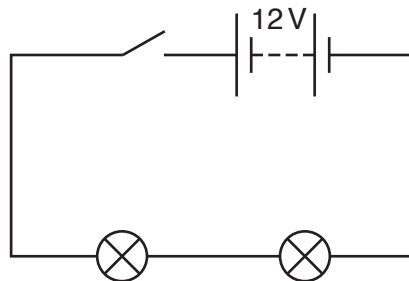


Fig. 3

- (a) In the space below draw a circuit using the same components but allowing one lamp to remain lit when the other has failed.

[3]

(b) Fig. 4 shows a motor.

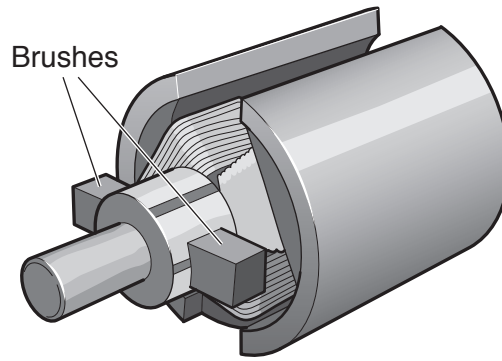


Fig. 4

(i) Add labels to the motor in Fig. 4 to show **two** other components. [2]

(ii) Describe the operation of the motor in Fig. 4 when current is applied to the brushes.

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

(iii) Complete the following statements by using the correct **three** terms from the list below.

- heat** **torque** **motion** **current**

An electric motor is a device that converts into

The rotating force produced is called

[3]

4 Fig. 5 shows a hydraulic application including the hydraulic/cylinder ram and hydraulic fluid supply.

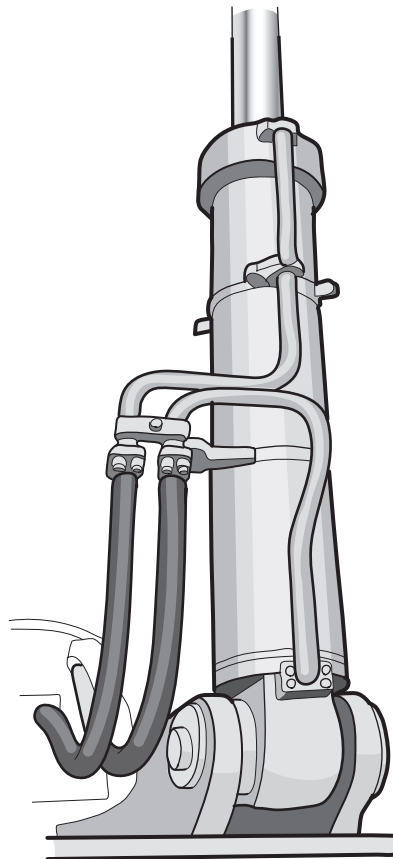


Fig. 5

(a) (i) State the type of hydraulic cylinder used in this application.

..... [1]

(ii) Explain why this application uses two hydraulic hoses to the cylinder.

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

(iii) State **one** impact of a hydraulic fluid leak from one of the hoses.

..... [1]

(b) Fig. 6 shows a pump used in a hydraulic application, such as a digger excavator.

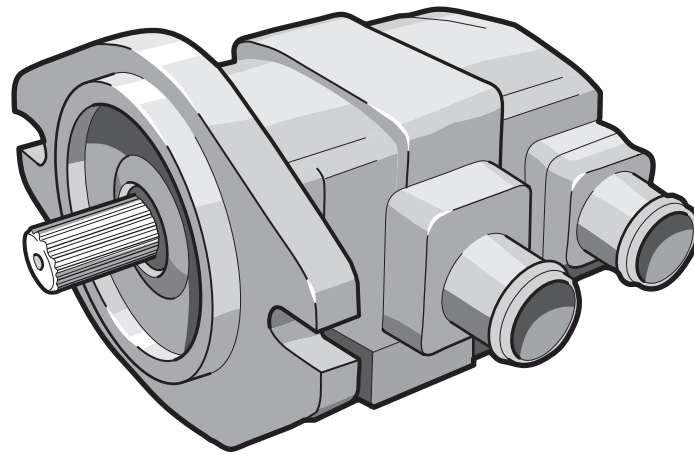


Fig. 6

Describe a system that could be used to drive the pump providing pressure to the hydraulic system.

Use the terms below in your answer.

Gearbox

Engine

Hydraulic hoses

Control valve

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

(c) Calculate the cross-sectional area of a piston when the force exerted by the out-stroking piston is 10 kN and the working pressure in the cylinder is 500 kN/m².

Use the formula Cross-sectional area = force/pressure

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

5 Fig. 7 shows a mechanism used in a toy car.

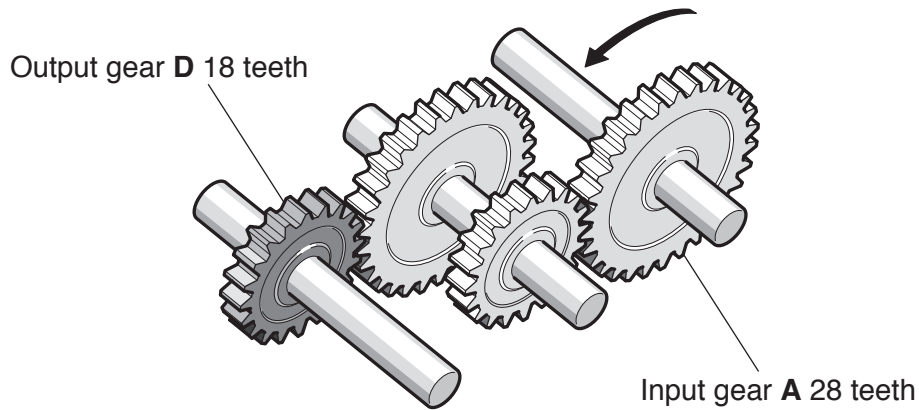


Fig. 7

(a) (i) Draw an arrow on Fig. 7 to show the direction of rotation for gear D. [1]

(ii) State the type of gear arrangement shown.

..... [1]

(iii) Give **one** advantage of using the type of gearbox shown in Fig. 7 for the toy car.

..... [1]

(iv) State the effect on the rotational speed of the output gear caused by increasing the number of teeth on the input gear.

..... [1]

(b) A DC motor is to be connected to the gear train shown in Fig. 7 to power the car.

Describe a mechanical system that could be used to connect the motor to the gear train.

.....

 [3]

(c) Fig. 8 shows a rack and pinion gear arrangement.

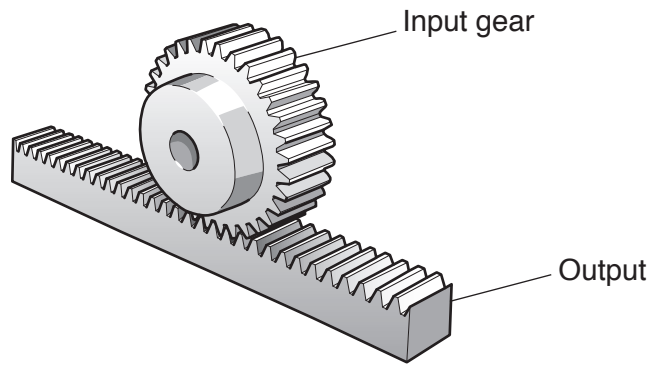


Fig. 8

(i) Give **one** application where this could be used.

..... [1]

(ii) Describe the conversion of motion that takes place from the input gear to the output in Fig. 8.

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

Turn over for the next question

6 (a) Describe what is meant by the term 'fluid power'.

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

(b) Give **one** application of fluid power.

..... [1]

(c)* Discuss the benefits of using fluid power applications in manufacturing.

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END OF QUESTION PAPER

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