OCR
RECOGNISING ACHIEVEMENT

Wednesday 22 May 2013 – Afternoon

GCSE DESIGN AND TECHNOLOGY
Electronics and Control Systems

A514/03 Technical Aspects of Designing and Making: Mechanisms

A528740613

Candidates answer on the Question Paper.

OCR supplied materials:
None

Other materials required:
- A calculator may be used

Duration: 1 hour 15 minutes

A514030

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions in **Section A and Section B**.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- 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).
- Show all your working out for calculations.
- Do **not** write in the bar codes.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- The total number of marks for this paper is **60**.
- Marks will be awarded for the use of correct conventions.
- Dimensions are in millimetres unless stated otherwise.
- The quality of your written communication will be taken into account in marking your answer to the question marked with an asterisk (*).
- This document consists of **16** pages. Any blank pages are indicated.

A calculator may be used for this paper

SECTION A

Answer **all** questions.

1 Fig. 1 shows a wall mounted waste paper log maker and a fuel block.

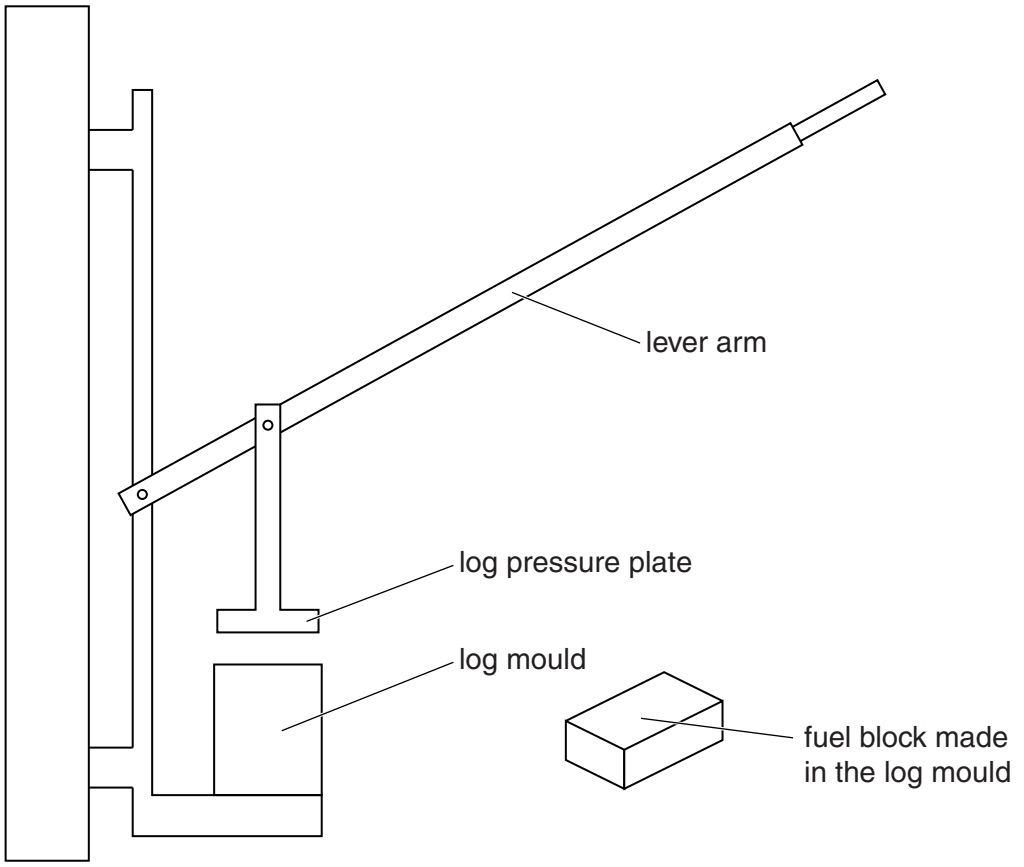

Fig. 1

(a) On Fig. 1 label, with arrows, the Load (L) Effort (E) and Fulcrum (F) of the lever arm. **[3]**

(b) **(i)** Name a suitable metal for the lever arm.

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

(ii) Give **two** reasons why stainless steel is suitable for the log pressure plate and log mould.

1 .....

2 .....

[2]

(c) Fig. 2 shows part of the waste paper log maker mechanism.

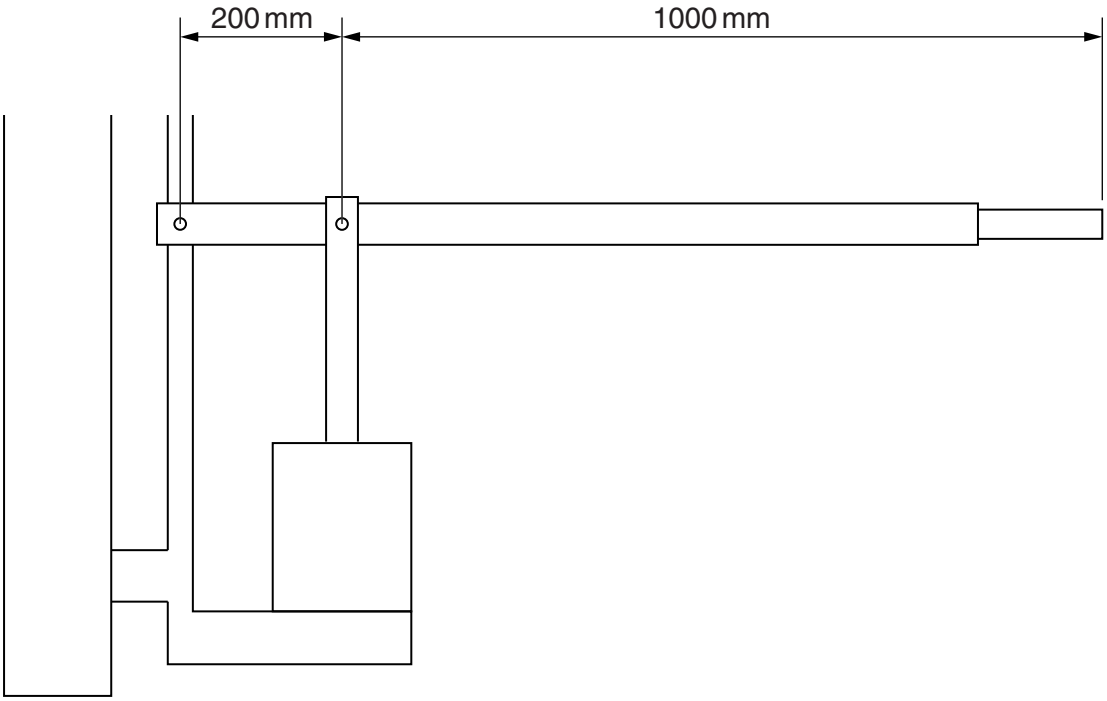

Fig. 2

If the user exerts a force of 10 Nm, calculate the force applied to the load.

Use the formula below

Moment = force × distance
In equilibrium Mc=Mac
Mc = clockwise moment Mac = anticlockwise moment

.....

.....

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

(d) Using sketches and notes show on Fig. 3 **three** ways in which the waste paper log maker could be improved.

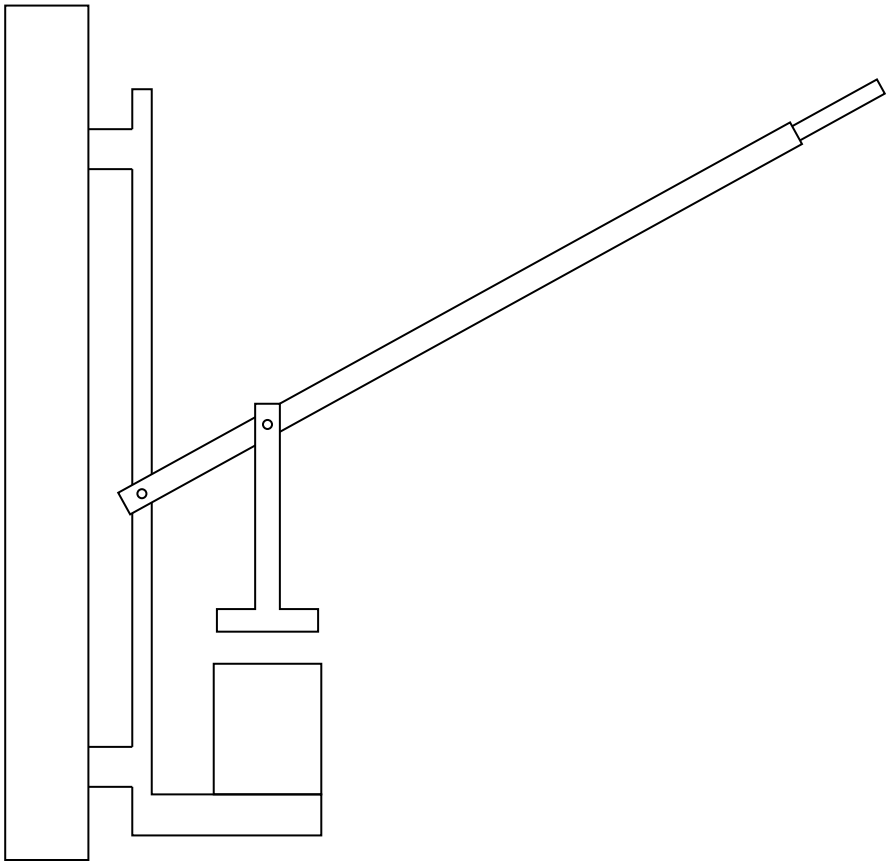

Fig. 3

[3]

[Total: 12]

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Question 2 begins on page 6

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2 Fig. 4 shows part of a machine.

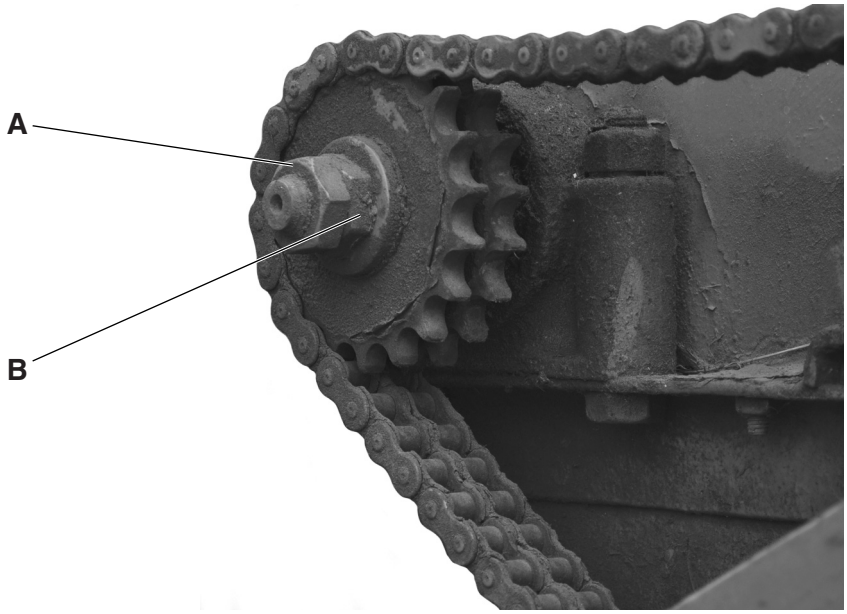

Fig. 4

(a) (i) Name the type of drive mechanism shown in Fig. 4.

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

(ii) Give **two** advantages of the drive mechanism shown in Fig. 4.

1 .....

.....

2 .....

.....

[2]

(iii) Give **two** disadvantages of the drive mechanism shown in Fig. 4.

1 .....

.....

2 .....

.....

[2]

(iv) State the purpose of nut **A** and nut **B** shown in Fig. 4.

A .....

B .....

[2]

(v) Name a single component that could replace nuts **A** and **B**.

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

(b) Fig. 5 shows a drive system.

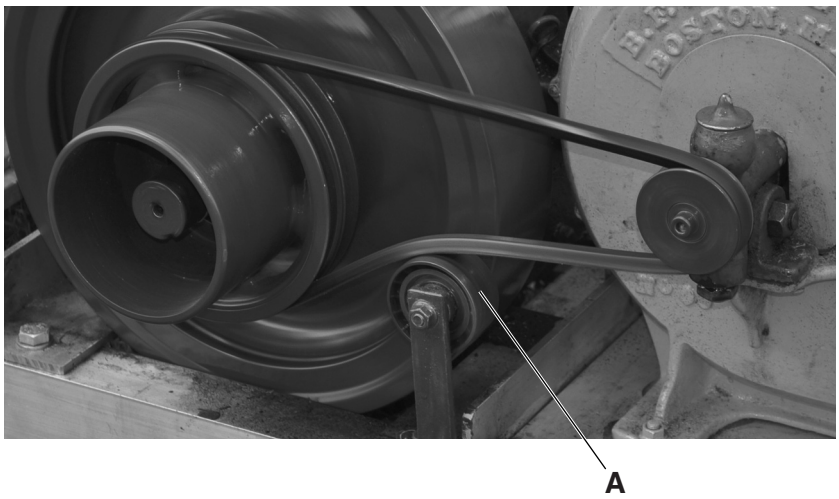

Fig. 5

(i) Name the type of drive system shown in Fig. 5

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

(ii) State the technical term for part **A**.

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

[Total: 12]

3 Fig. 6 shows a hand held jigsaw.

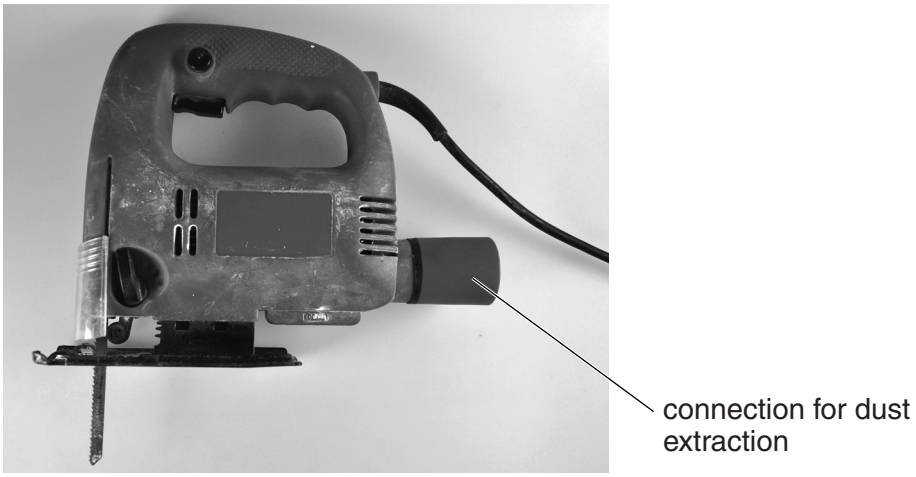

Fig. 6

(a) Complete the sentence below.

The r..... motion of the motor is transferred into

r..... motion of the jigsaw blade. **[2]**

(b) The jigsaw has a connection for dust extraction.

Explain why dust extraction is needed.

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

(c) Fig. 7 shows part of a mechanism on a tie-down strap used for securing loads.

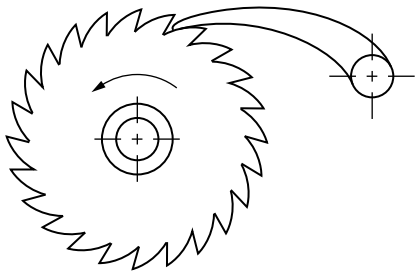

Fig. 7

Give the full name of the mechanism shown in Fig. 7.

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

(d)* Explain how mechanisms such as gears and levers have made the modern bicycle much easier and safer to use.

Marks will be awarded for the quality of written communication in your answer.

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.... **[6]**

[Total: 12]

SECTION B

Answer **all** questions.

4 Fig. 8 shows a child's pull along toy.

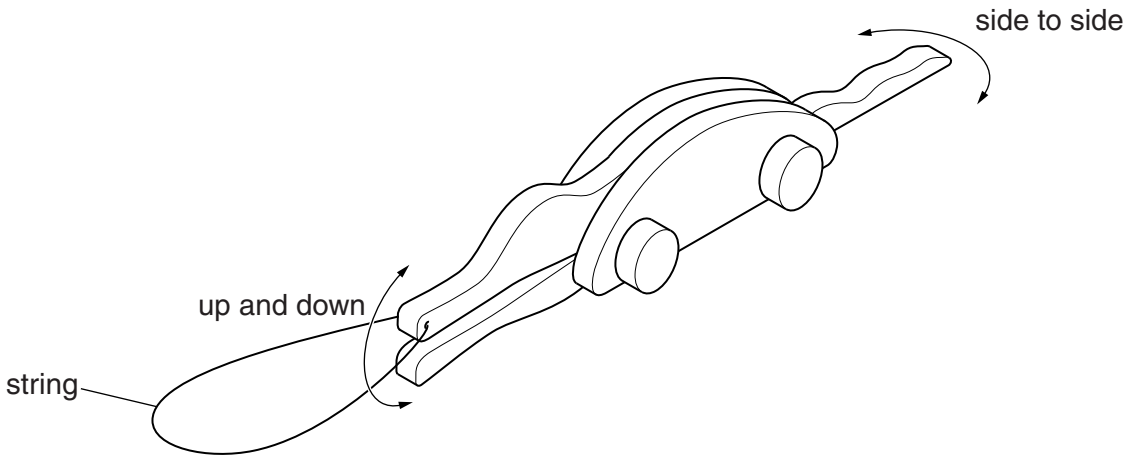

Fig. 8

As the toy is pulled along the lower jaw opens and closes and the tail moves from side to side.

(a) Use sketches and notes to design **two** mechanisms that will provide movement of the jaw and tail as shown in Fig. 8.

Label all parts of each mechanism.

[6]

(b)* Discuss how ergonomics and anthropometrics are considered when designing toys that include a mechanism.

Marks will be awarded for the quality of written communication in your answer.

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.... **[6]**

[Total: 12]

5 Fig. 9 shows an electro-mechanical servo motor for use in a model aircraft.

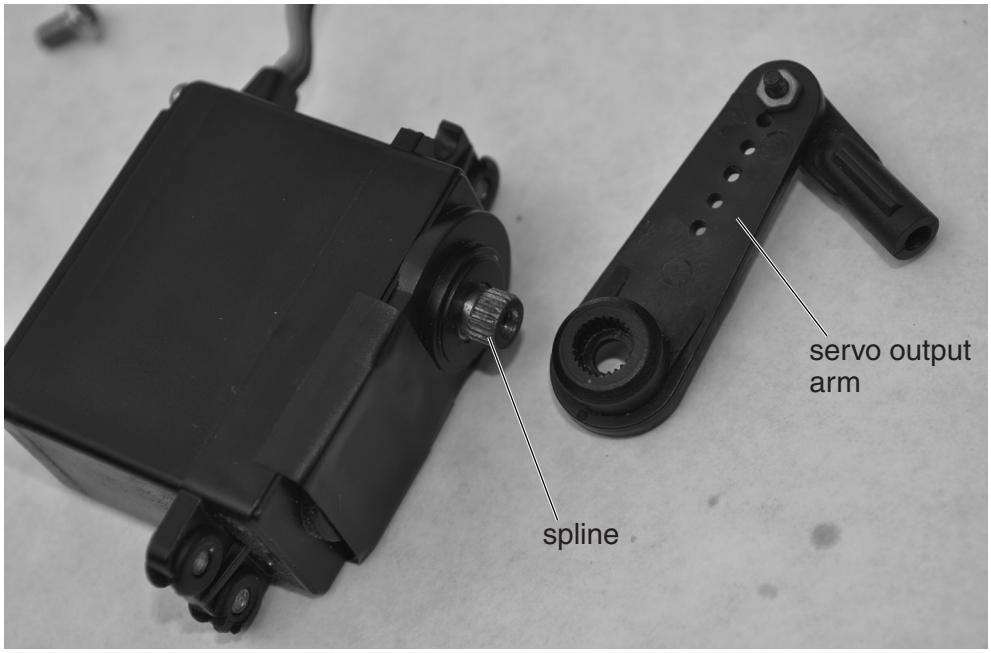

Fig. 9

(a) (i) Explain why a spline has been used on the output shaft.

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

(ii) The servo output arm has a number of different holes to provide adjustment. Explain why it needs to be adjustable.

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

(iii) The servo motor shown in Fig. 9 is a high-torque servo motor. State what is meant by torque.

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

(iv) State the SI unit used for measuring torque.

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

(b) Fig. 10 shows the internal gear train used in the servo motor.

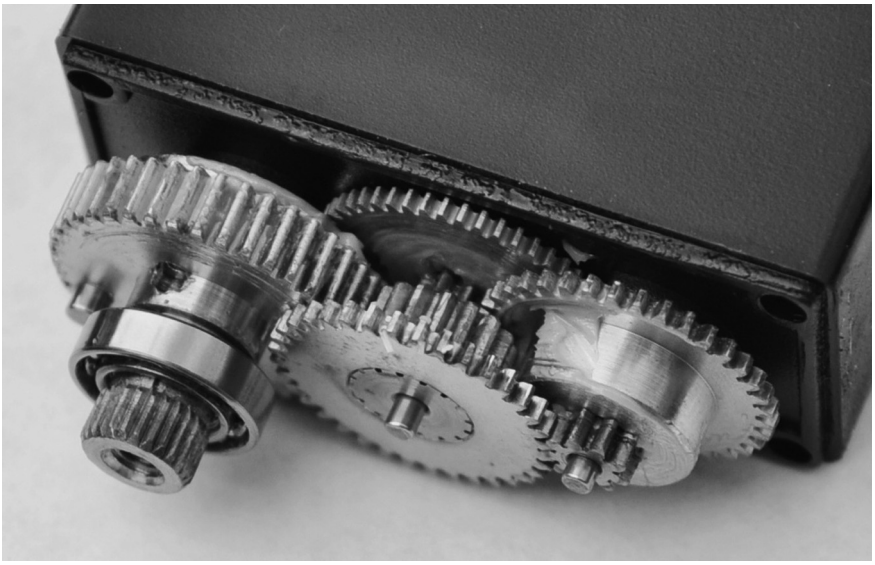

Fig. 10

(i) Tick (✓) the term below that describes multiple gears used in the train.

Conversion	Compound	Complicated

[1]

(ii) Name a suitable non-ferrous metal for the gears shown in Fig. 10.

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

(c) (i) Fig. 11 shows a ball bearing race fitted to the servo motor output shaft.

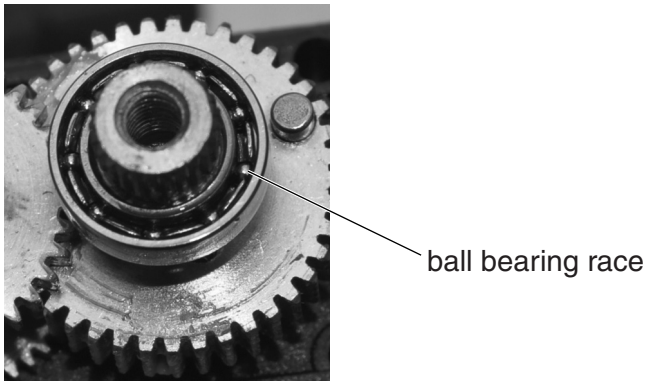

Fig. 11

Give **one** advantage of using a ball bearing race rather than a plain bearing.

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

(ii) Fig. 12 shows a servo arm attached to a model aircraft rudder.

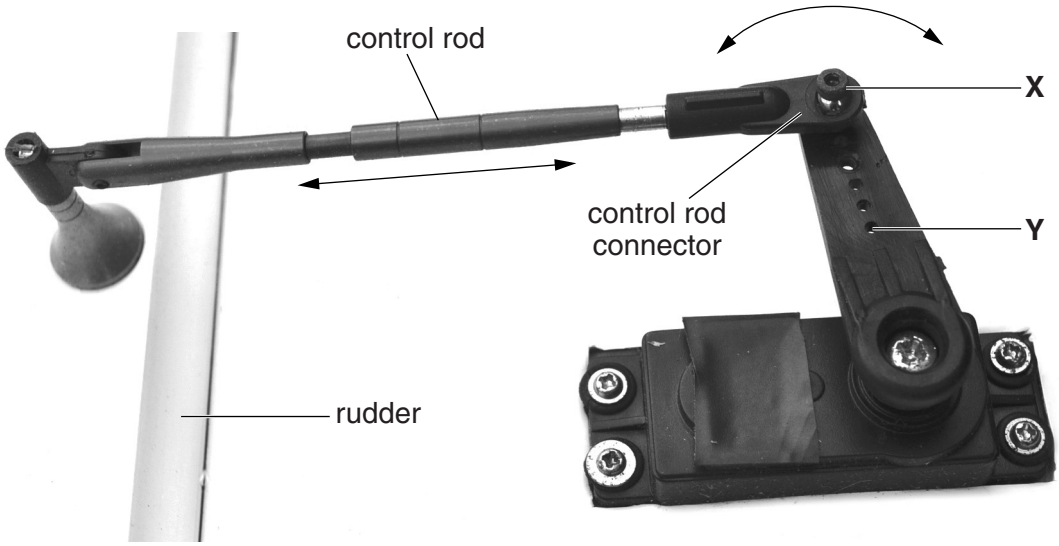

Fig. 12

The control rod connector is moved from the hole labelled **X** to the hole labelled **Y** on the servo arm.
Describe the effect on the **movement** of the rudder connected to the servo arm.

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

[Total: 12]

END OF QUESTION PAPER

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