

GENERAL CERTIFICATE OF SECONDARY EDUCATION**DESIGN AND TECHNOLOGY****1957/08****Systems and Control Technology****Paper 8 Mechanisms (Higher Tier)**

Candidates answer on the Question Paper

OCR Supplied Materials:

None

Other Materials Required:

None

Wednesday 26 May 2010**Afternoon****Duration: 1 hour 15 minutes**Candidate
ForenameCandidate
Surname

Centre Number

Candidate Number

INSTRUCTIONS TO CANDIDATES

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Answer **all** the questions.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Show all working out for calculations.
- Do **not** write in the bar codes.
- 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).

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 **50**.
- Dimensions are in millimetres unless stated otherwise.
- Marks will be awarded for the use of correct conventions.
- This document consists of **12** pages. Any blank pages are indicated.



- 1 Fig. 1 shows part of a flood defence system. Aluminium barge boards are lowered from lorries into fixed 'H' section supports at times of danger from rising floodwater.

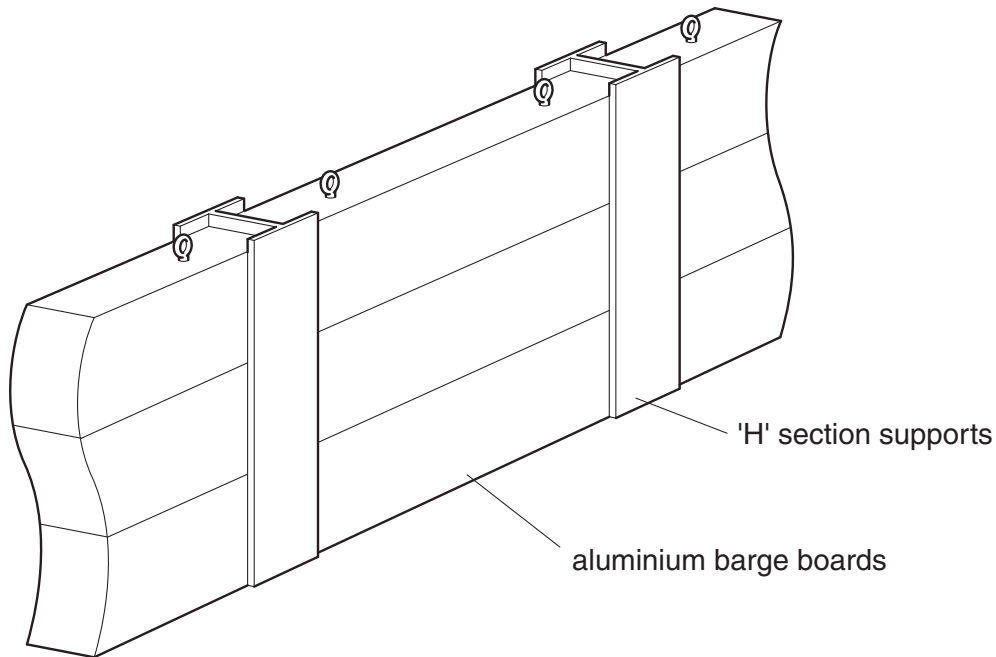


Fig. 1

- (a) Give **two** reasons why aluminium is used for the barge boards.

Reason 1 [1]

Reason 2 [1]

- (b) Explain **two** ways that CAD could have been an advantage to the designers of the flood defence system.

1 [2]

2 [2]

Fig. 2 shows a hoist used to lift the barge boards from the lorry into position. The hoist uses a lever system.

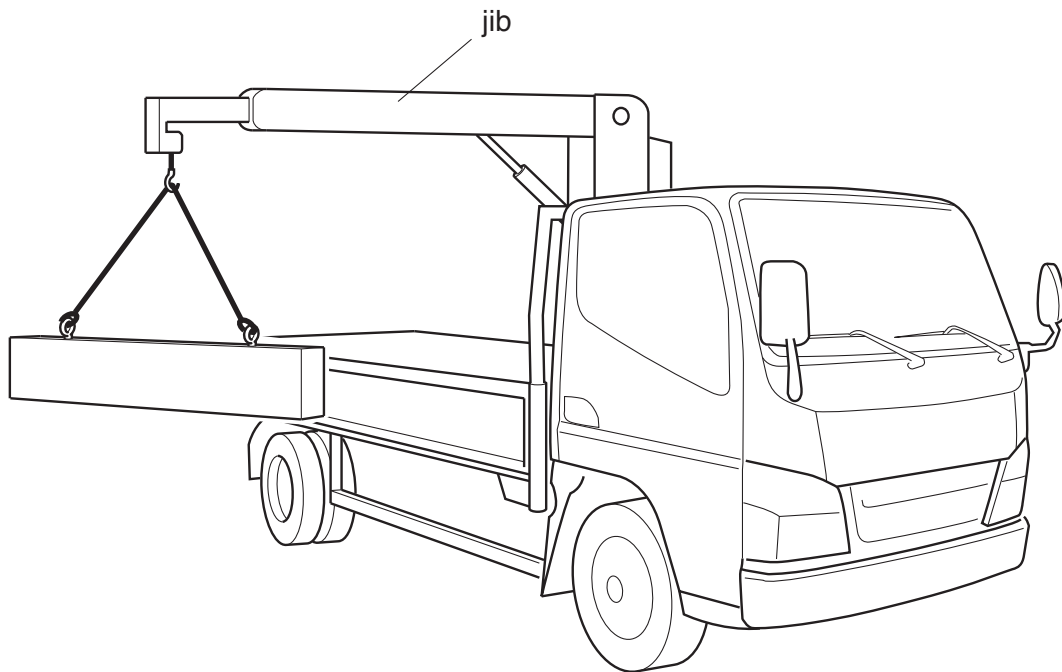


Fig. 2

(c) State the class of leverage in the jib.

..... [1]

(d) Give **two** reasons why this class of lever is used in this situation.

..... [1]

..... [1]

(e) Give **one** disadvantage that this class of lever has compared with the other two classes.

..... [1]

[Total: 10]

- 2 Fig. 3 shows an alternative flood defence system with a height adjustable barrier.

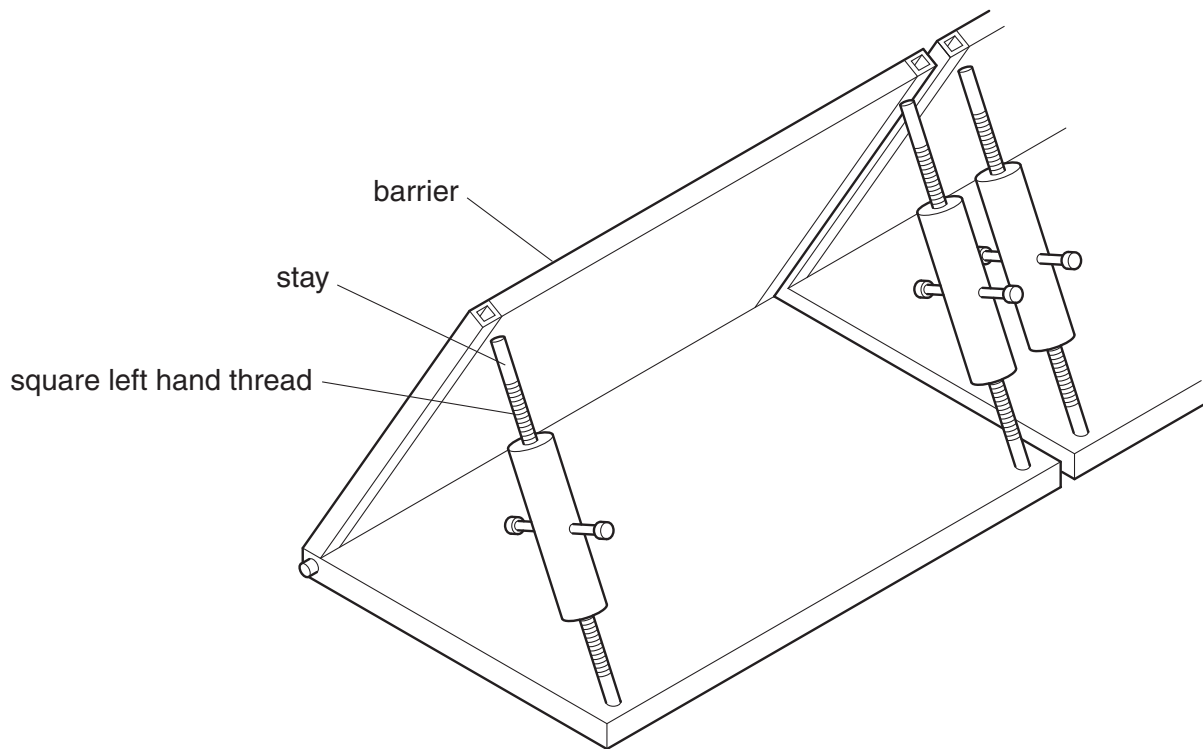


Fig. 3

- (a) Give **two** reasons why screw threads are used in adjustable systems.

1 [1]

2 [1]

- (b) Explain why a square thread has been used in the flood barrier system instead of a V-thread.

..... [2]

- (c) Give **one** other mechanical system that uses a square thread for adjustment.

..... [1]

- (d) Give the conversion of motion that takes place in this type of system.

..... [1]

- (e) Fig. 4 shows part of the barrier and stay. The adjustable stays need to be securely attached to the top of the barrier.

Design a fitting on Fig. 4 that will:

- allow the stay to pivot as the screw is adjusted; [1]
- prevent the stay from rotating while the screw is adjusted; [1]
- securely attach the stay to the barrier. [1]

Label any additional fittings. [1]

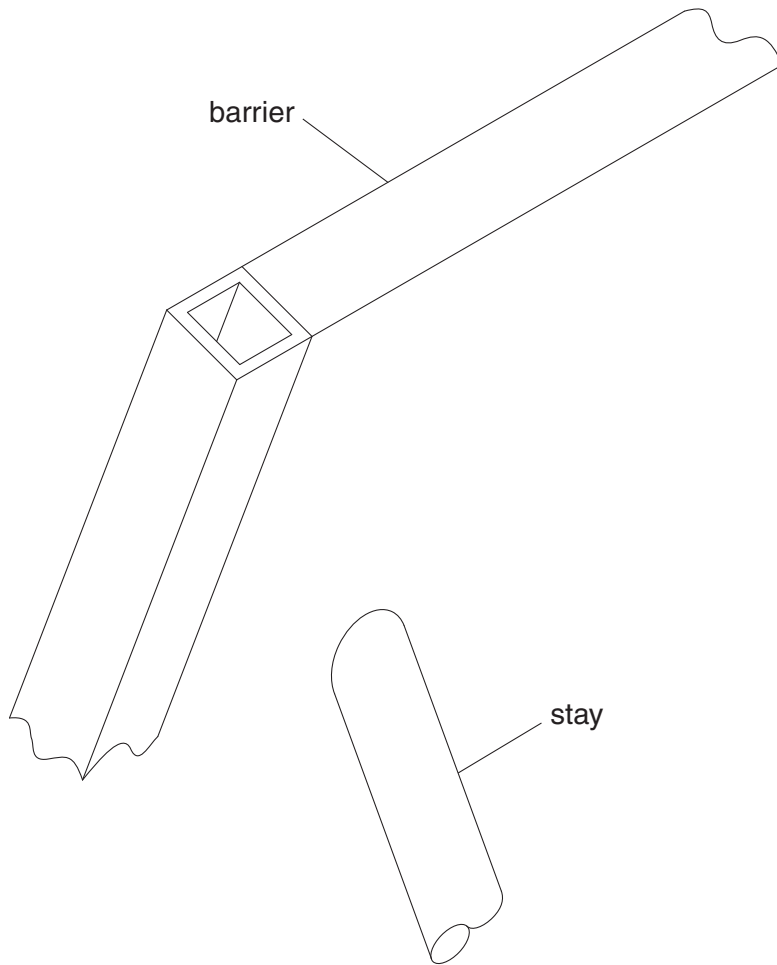


Fig. 4

[Total: 10]

- 3 Parts of the flood defence system need to be assembled quickly. Fig. 5 shows a socket and wrench used for this purpose.

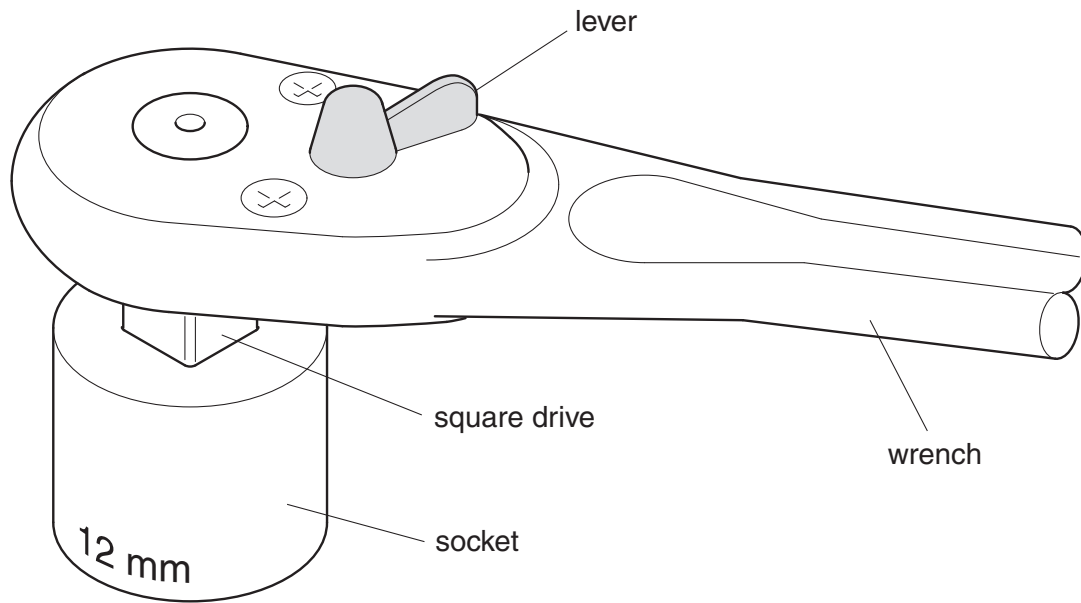


Fig. 5

- (a) Explain the purpose of the lever on the wrench.

.....
 [2]

- (b) The socket and wrench uses a ratchet and pawl mechanism. Use sketches and notes to explain how this type of system works.

When flooding risk has passed the barriers need to be removed easily.

- (c) Explain the need for lubrication in the flood defence system mechanism.

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

- (d) State the most appropriate type of lubrication applied to the mechanism in this application and give a reason for your choice.

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

[Total: 10]

- 4 Fig. 6 shows a wrench with a gripping action that can be locked in place. The locking function is achieved by means of a toggle clamp.

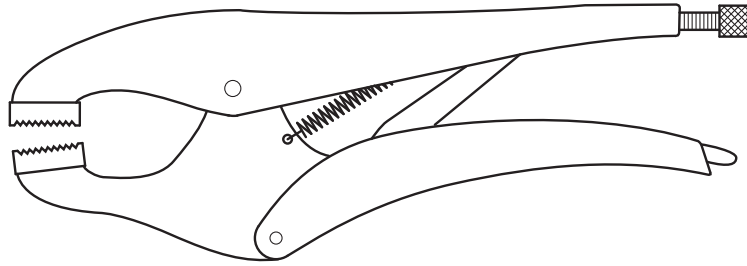


Fig. 6

Toggle systems are used in many industrial clamping applications.

- (a) Use sketches and notes to explain how a toggle system operates.

- (b) The type of wrench shown in Fig. 6 is often used to grip round shafts during maintenance operations of a gearbox.

Show on Fig. 7 a modification to the jaw that will ensure a firm grip on a round shaft but prevent damage to the shaft of a gearbox.

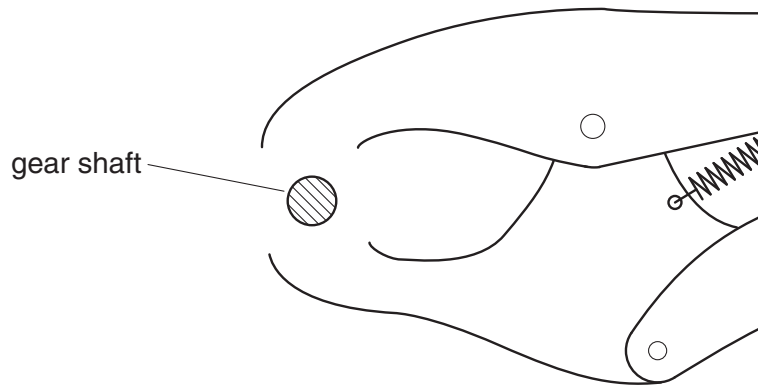


Fig. 7

[2]

- (c) Fig. 8 shows part of a gearbox.

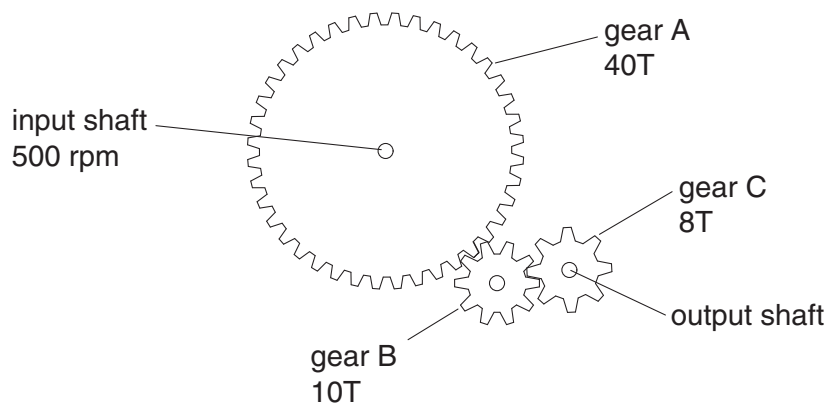


Fig. 8

- (i) Explain the purpose of gear B.

.....
 [2]

- (ii) Calculate the output speed of the gearbox.

Use the formula $VR = \frac{\text{driven}}{\text{driver}}$

.....

 [2]

[Total: 10]

Turn over

5 Fig. 9 shows a partly completed wind powered garden ornament.

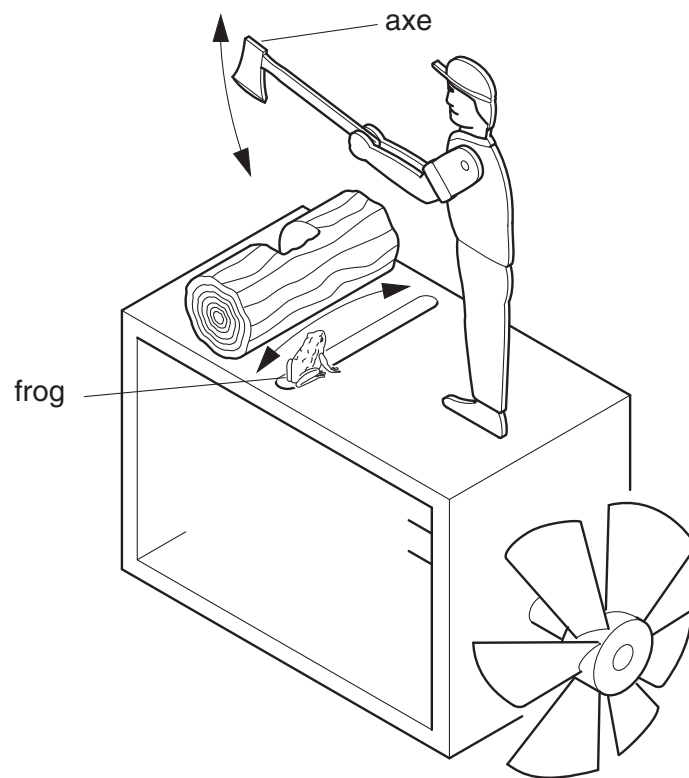


Fig. 9

(a) Explain the benefit of using wind power instead of mains power for this ornament.

.....

.....

..... [2]

- (b)** Use sketches and notes to complete the design of the garden ornament. Clearly show the mechanical system that will meet the specification below.

The system must:

- lift the axe slowly;
- cause the axe to fall suddenly;
- oscillate the frog as shown by the arrow.

Show all additional components.

[8]

[Total: 10]

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