

**GENERAL CERTIFICATE OF SECONDARY EDUCATION**

**DESIGN AND TECHNOLOGY**

**Systems and Control Technology Core**

Paper 1 (Foundation Tier)

**1957/01**

Candidates answer on the Question Paper

**OCR Supplied Materials:**

None

**Other Materials Required:**

None

**Friday 11 June 2010**

**Afternoon**

**Duration: 1 hour**



Candidate  
Forename

Candidate  
Surname

Centre Number

Candidate Number

**INSTRUCTIONS TO CANDIDATES**

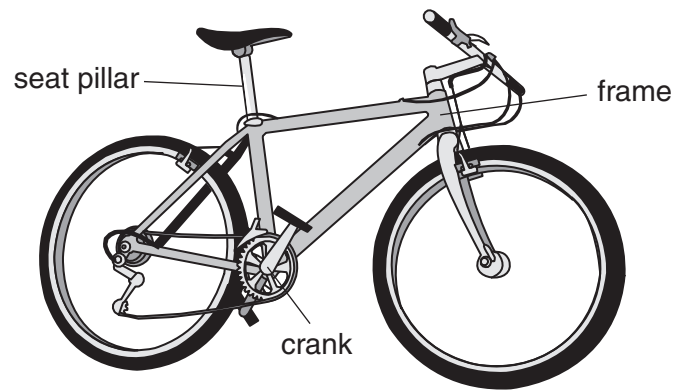
- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- 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 a mountain bike.



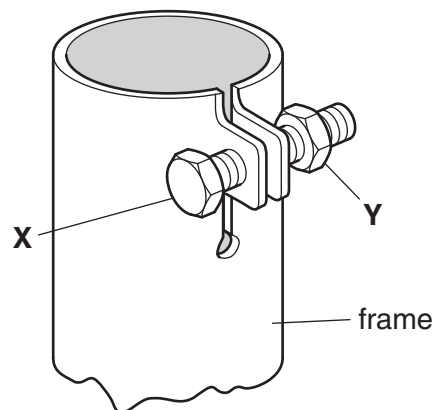
**Fig. 1**

(a) Complete the table of materials used in the mountain bike.

part	material	surface finish
crank		self finish
seat pillar		chrome plated
frame		spray paint

[3]

(b) Fig. 2 shows how the seat pillar is secured in position.



**Fig. 2**

Name the components **X** and **Y** in Fig. 2.

Component **X** .....

Component **Y** ..... [2]

- (c) The designer needs to use body measurements from a range of possible users of the mountain bike.

Choose **two** measurements from the list below that the designer would not need.

**Foot width      leg length      waist size      hat size      width of hand      arm length**

Measurement 1 .....

Measurement 2 ..... [2]

- (d) Add a label to Fig. 3 to show **one** point where a high level of friction is needed.



**Fig. 3**

[1]

- (e) The separate parts of the bike frame are held in a jig while the frame is welded. Give **two** reasons for using a jig when welding the frame.

Reason 1 .....

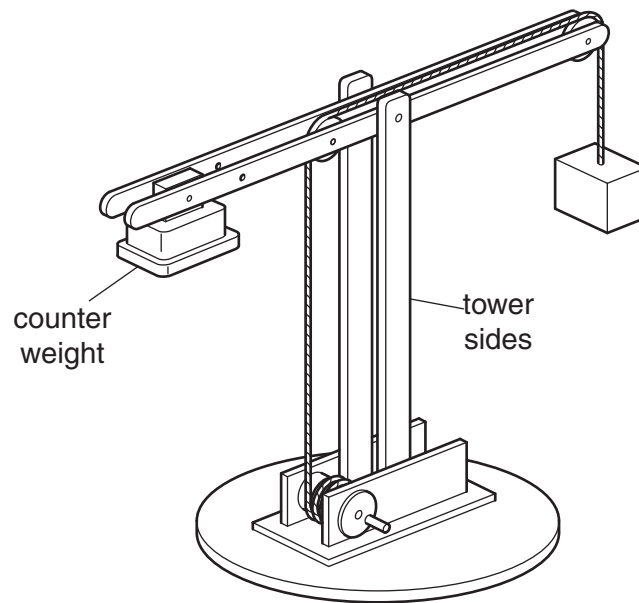
.....

Reason 2 .....

..... [2]

[Total: 10]

- 2 Fig. 4 shows a model tower crane used for lifting small loads.



**Fig. 4**

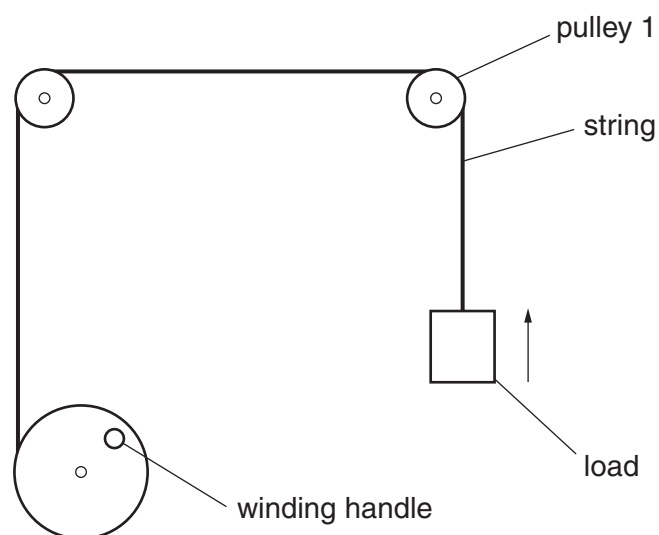
- (a) (i) Give the reason for using the counterweight.

..... [1]

- (ii) State why the distance of the counterweight from the tower sides can be changed.

..... [1]

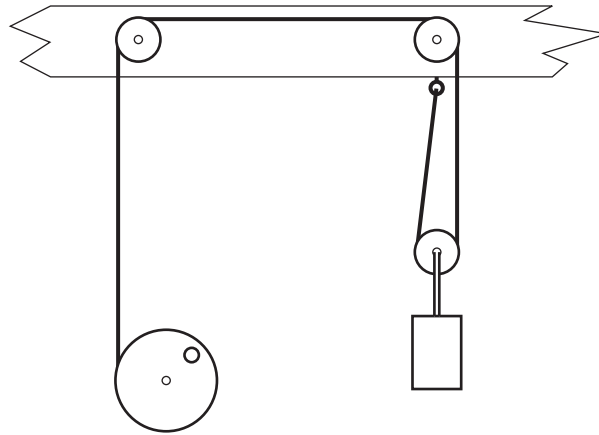
- (b) Fig. 5 shows the system for lifting the load.



**Fig. 5**

- (i) The arrow on Fig. 5 shows the direction of movement of the load. Add arrows to Fig. 5 to show the direction of rotation of the winding handle and of pulley 1 when the load is lifted. [2]

(ii) Fig. 6 shows an improved system for lifting the load.



**Fig. 6**

Give **two** effects of using this system.

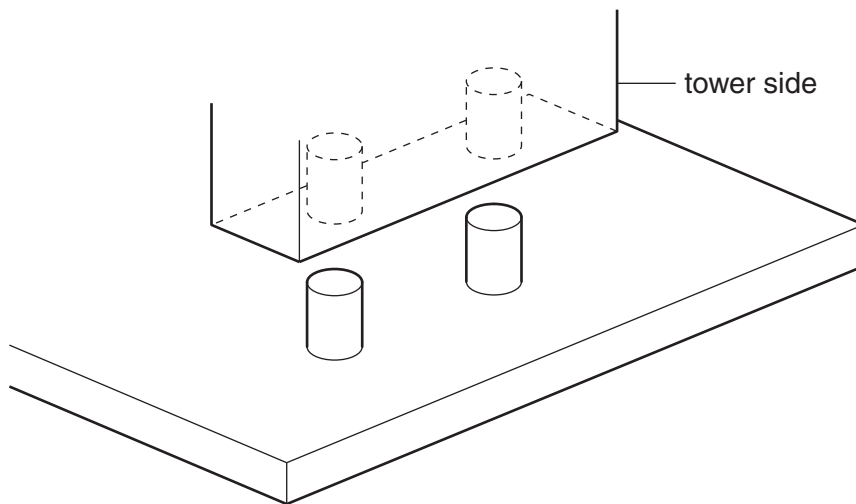
Effect 1 .....

.....

Effect 2 .....

..... [2]

(c) Fig. 7 shows details of how the tower sides are joined to the base.

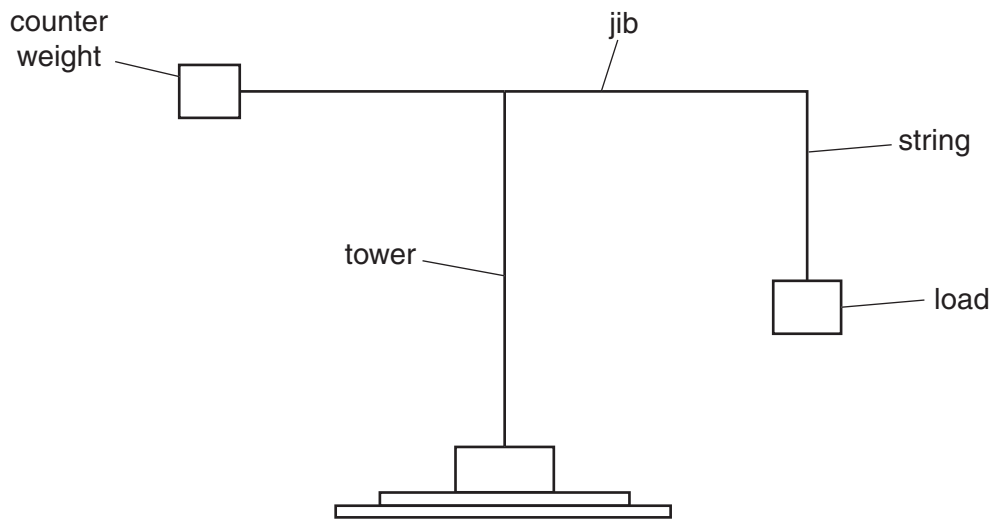


**Fig. 7**

Name the type of joint used.

..... [1]

- (d) Fig. 8 shows a line diagram of the crane. When the load is lifted forces act on parts of the crane.



**Fig. 8**

Name a part which is in bending.

.....

Name a part which is in tension.

.....

Name a part which is in compression.

..... [3]

**[Total: 10]**

- 3 In some sports the game may be stopped if the level of light is too low. Fig. 9 shows a hand held light level detector.

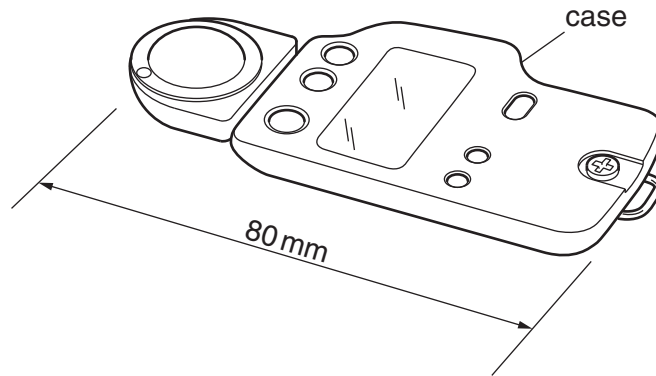
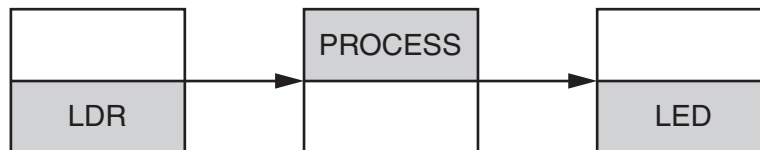


Fig. 9

- (a) The case of the light level detector has been designed with curved surfaces. Give **one** reason for the case being designed in this way.

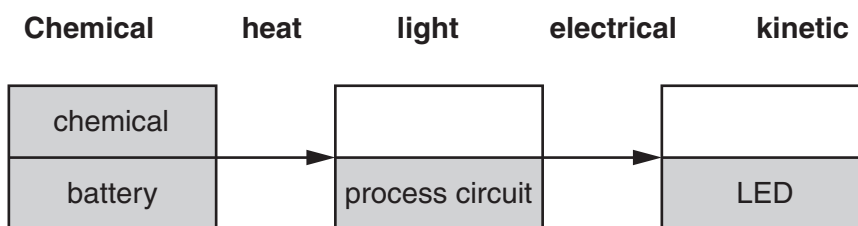
.....  
 ..... [1]

- (b) Complete the block diagram below for the system used in the light level detector.



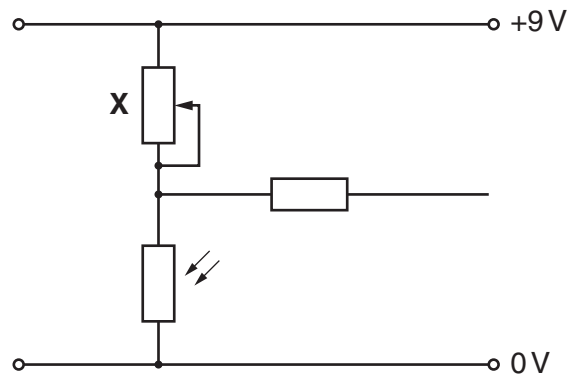
[3]

- (c) The light level detector uses a battery as a source of energy. Complete the block diagram below by choosing from the list the type of energy involved at each stage.



[2]

(d) Fig. 10 shows part of the light detector circuit.



**Fig. 10**

(i) Describe the effect of light on the LDR in the circuit.

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

(ii) Explain the reason for using component **X** in the circuit rather than a fixed resistor.

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

**[Total: 10]**

4 Fig. 11 shows an electric train set.

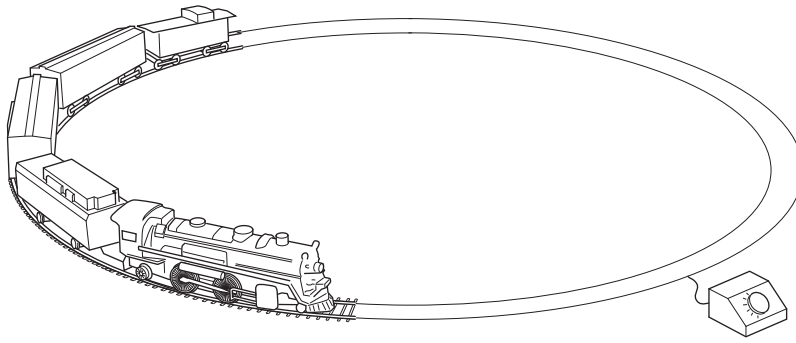


Fig. 11

- (a) A 230V mains transformer is used to supply 12V DC to the train engine.  
Give **one** reason why the train engine is powered by 12V DC.

..... [1]

- (b) Fig. 12 shows details of the drive unit for the train engine.

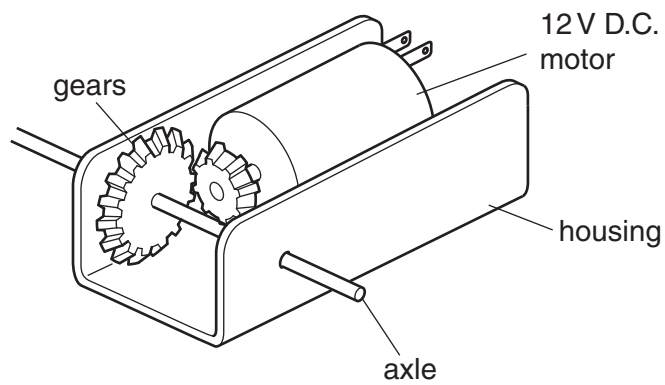


Fig. 12

Give **two** reasons why gears are needed in this drive unit.

Reason 1 .....

.....

Reason 2 .....

..... [2]

- (c) When the complete drive unit was tested the axle did not turn smoothly.  
Give **two** possible reasons for the axle not turning smoothly.

Reason 1 .....

.....

Reason 2 .....

..... [2]

- (d) Computer simulations are often used when designing gear systems.  
Give **two** benefits of using a computer simulation rather than real components when designing a gear system.

Benefit 1 .....

.....

Benefit 2 .....

..... [2]

- (e) At the end of its useful life the train set should be recycled.

- (i) Give **one** environmental problem to overcome when recycling materials from the train set.

..... [1]

- (ii) Describe how recycling information can be given on components made from plastics.

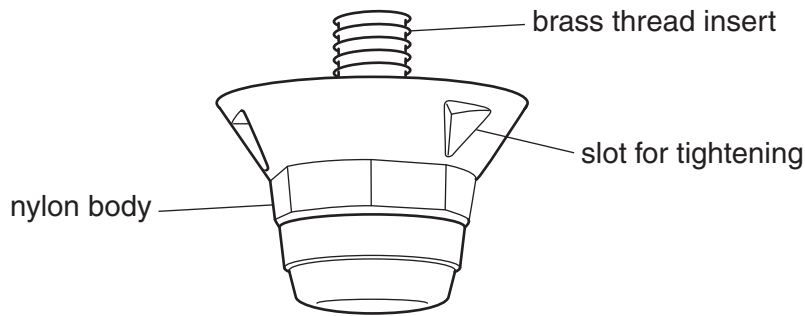
.....

.....

..... [2]

[Total: 10]

- 5 Boots with screw-in studs are worn for some sports. Fig. 13 shows details of a stud.



**Fig. 13**

- (a) The brass thread insert is machined using a CNC machine.

- (i) Name the type of CNC machine that would be used to produce this thread.

..... [1]

- (ii) Give **one** advantage to the manufacturer of using a CNC machine rather than a manual machine to produce a batch of 5000 studs.

..... [1]

- (iii) Explain why brass is used rather than steel for the thread insert.

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

- (b) The lower part of the stud is made from nylon.

- (i) State a suitable process for forming the nylon body of the stud.

..... [1]

- (ii) Give **one** reason why this process is suitable.

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

- (c) Quality control checks are made during manufacture.  
Give **two** quality control checks for the stud shown in Fig. 13.

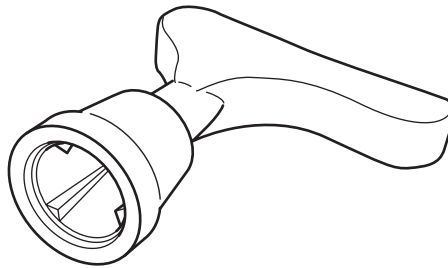
Check 1 .....

.....

Check 2 .....

..... [2]

- (d) Fig. 14 shows a specially shaped tool for inserting and removing the studs.  
Give **two** advantages of using this tool compared to a standard spanner.



**Fig. 14**

Advantage 1 .....

.....

Advantage 2 .....

..... [2]

**[Total: 10]**

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