

Candidate Name

Centre Number

Candidate
Number

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OXFORD CAMBRIDGE AND RSA EXAMINATIONS
General Certificate of Secondary Education

D&T: SYSTEMS AND CONTROL TECHNOLOGY 1957/8
MECHANISMS

PAPER 8 HIGHER TIER

Wednesday

8 JUNE 2005

Afternoon

1 hour 15 minutes

Candidates answer on the question paper.

Additional materials:

Formulae sheet: OCR (TABLES 2) (inserted)

TIME 1 hour 15 minutes

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided on the question paper.

Show all your working for calculations.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [] at the end of each question or part question.

Dimensions are in millimetres unless stated otherwise.

Marks will be awarded for the use of correct conventions.

FOR EXAMINER'S USE	
Q1	
Q2	
Q3	
Q4	
Q5	
TOTAL	

This question paper consists of 12 printed pages and an insert.

1 Fig. 1 shows a camera tripod which is sold to amateur photographers.

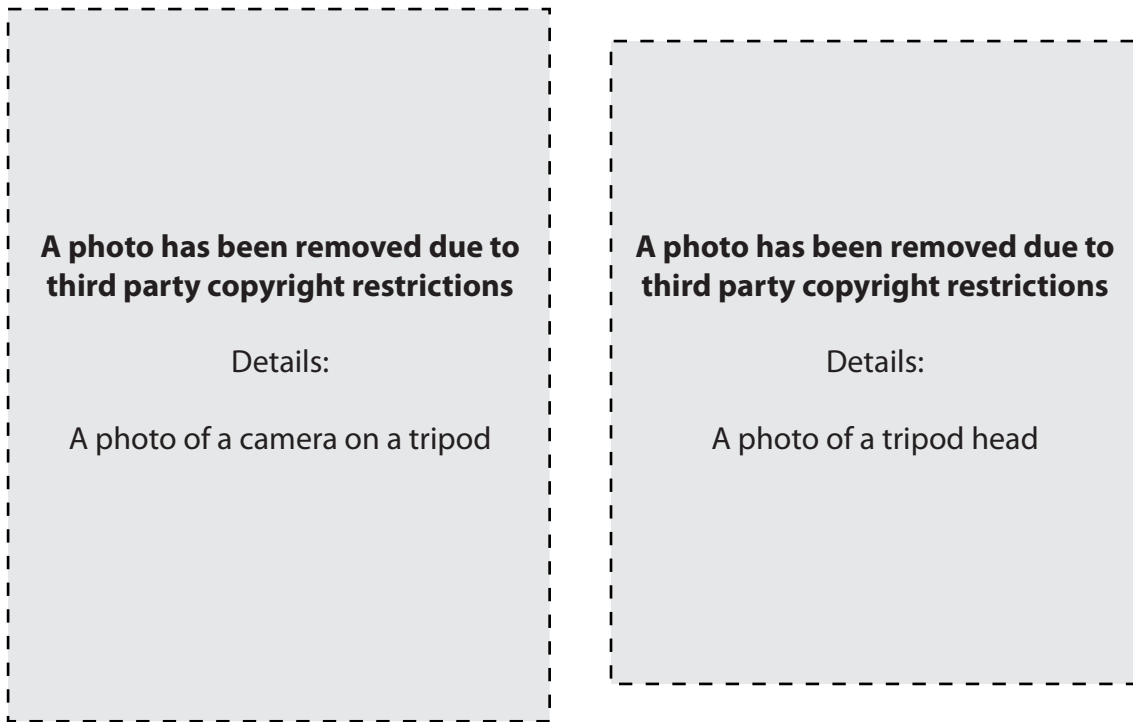


Fig. 1

The tripod is assembled from pre-manufactured components. Fig. 2 below shows part of the leg and hinge components before assembly.

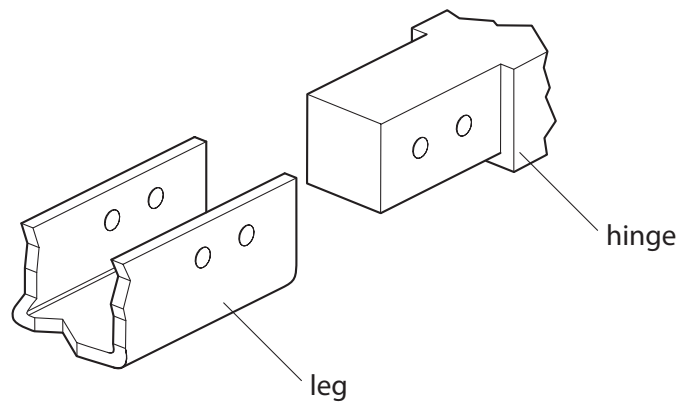


Fig. 2

(a) Explain two ways that CAM is an advantage to the manufacturer when these components are assembled.

1 _____ [2]

2 _____ [2]

- (b) Market research into this product suggested that some photographers would pay a higher price for the tripod to have greater stability.

Give one advantage to the designer of the tripod of using CAD.

_____ [1]

Fig. 3 shows the tripod with additional stability.



Fig. 3

- (c) The manufacturer sells both versions of these tripods.

Explain how batch production enables the manufacturer to do this profitably.

 _____ [2]

- (d) Consider one mechanical system in this product.

Explain how ergonomics have played a part in its design.

 _____ [2]

- (e) Give an example of where quality control is important during the manufacture of this product.

_____ [1]

2 Fig. 4 shows part of the height adjustment system on a camera tripod.

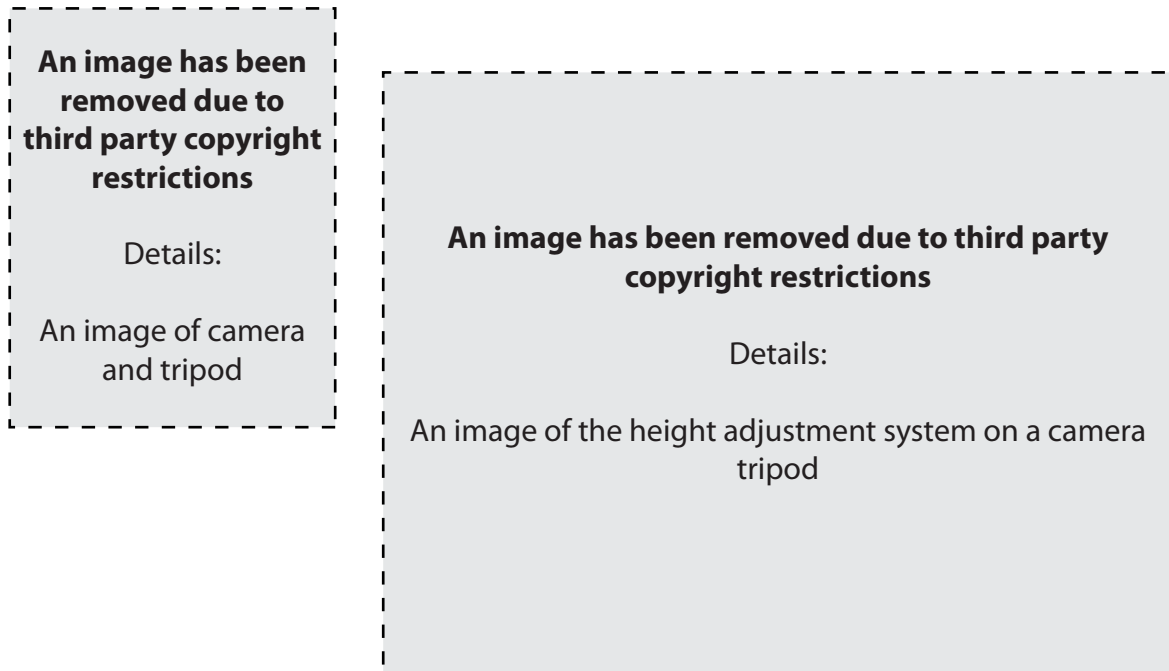


Fig. 4

(a) Gears are used in the height adjustment system.

(i) Name both parts of the gear system shown in Fig. 4.

_____ [2]

(ii) Describe the conversion of motion that takes place when the camera is raised.

_____ [2]

(b) As the height is being adjusted the hand grip needs to rotate freely.

Complete Fig. 5 below to show how the hand grip can be attached to the lever but still rotate freely.

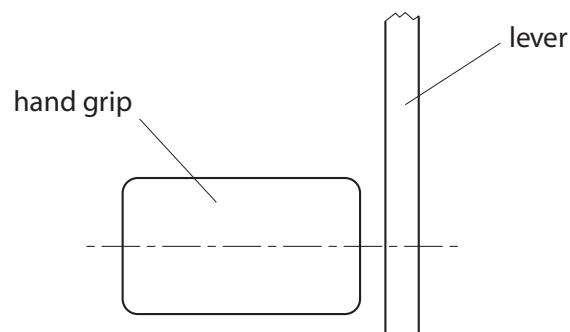


Fig. 5

[3]

- (c) The height adjustment system also includes a key and keyway on the pillar to prevent the pillar from turning.

Use sketches and notes to show how the key and keyway prevents the pillar from turning.

[3]

3 Fig.6 shows a tool used by gardeners to cut shrubs.

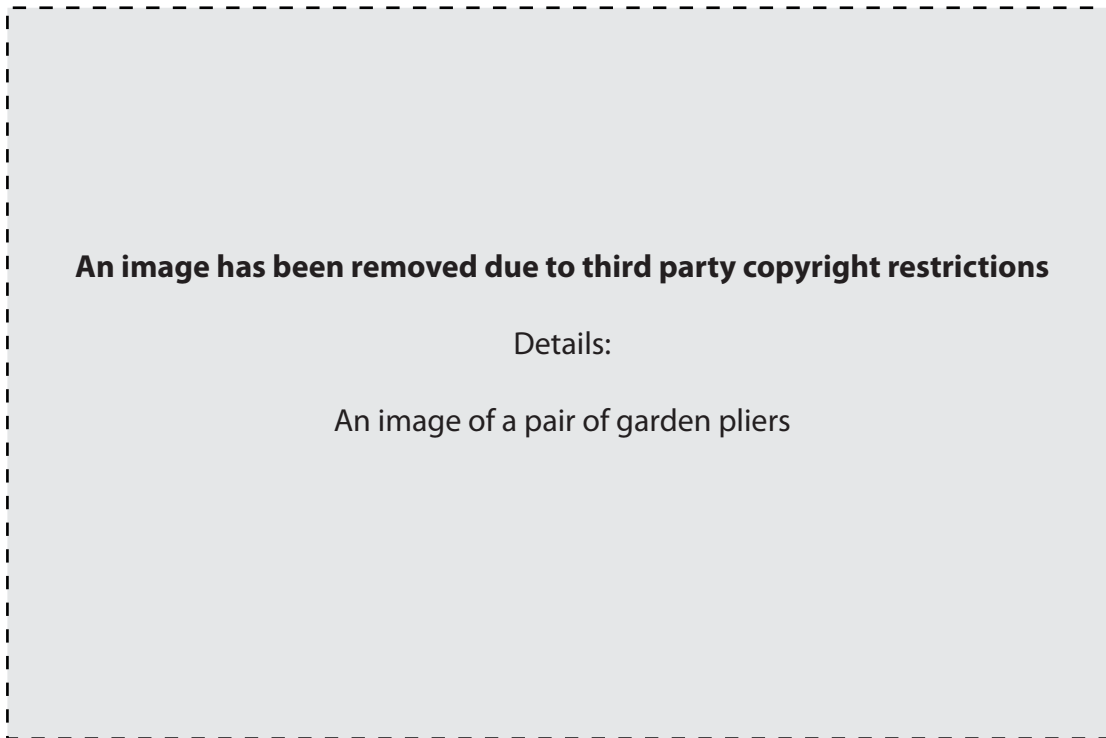


Fig.6

(a) Use calculations to explain why a better cutting action is achieved by placing the branch in position A rather than position B.

[3]

- (b) Fig.7 shows a garden tool that is designed to cut larger branches on trees.

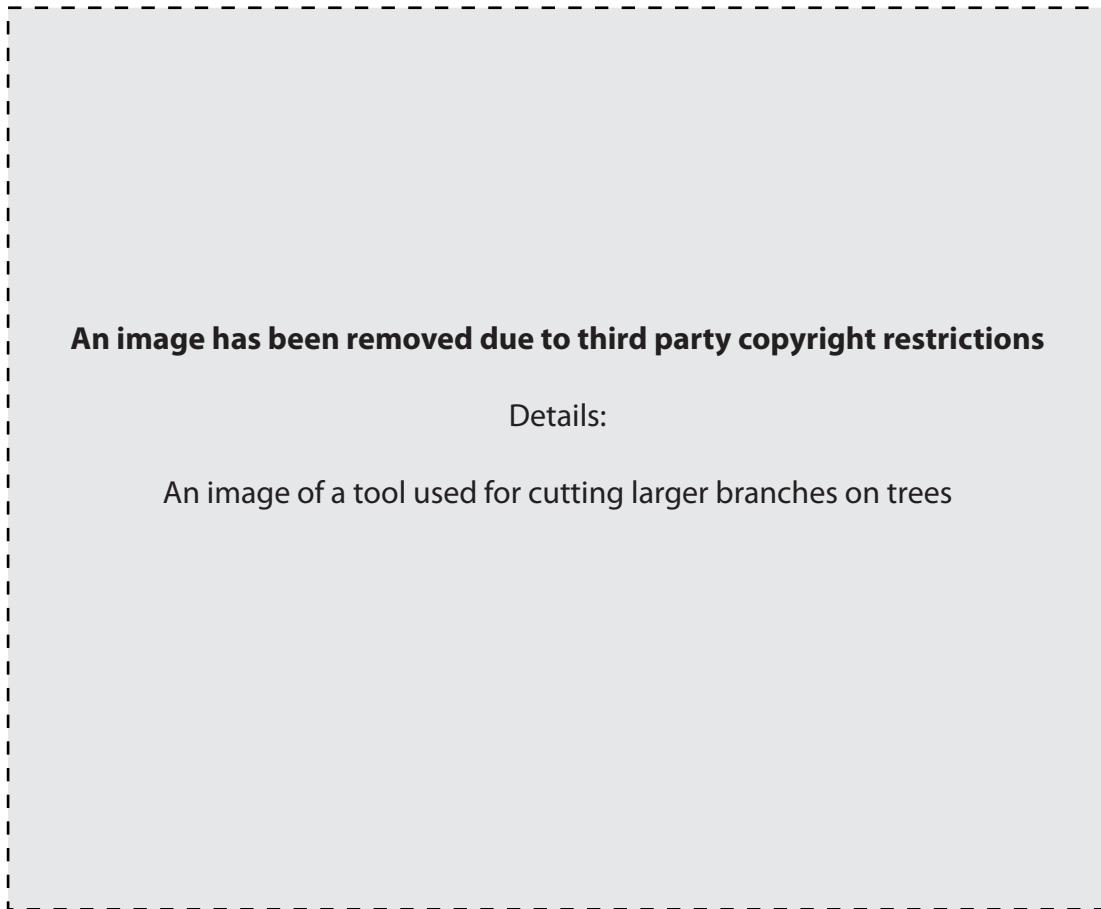


Fig.7

- (i) Calculate the mechanical advantage of the lever system.

_____ [2]

- (ii) Calculate the mechanical advantage of the pulley system.

_____ [2]

- (iii) Calculate the cutting force on the branch when the gardener pulls the rope with an input force of 5 N.

_____ [2]

- (c) Give one reason why the efficiency of this system is less than 100%.

_____ [1]

- 4 Fig. 8 shows a wind up torch.

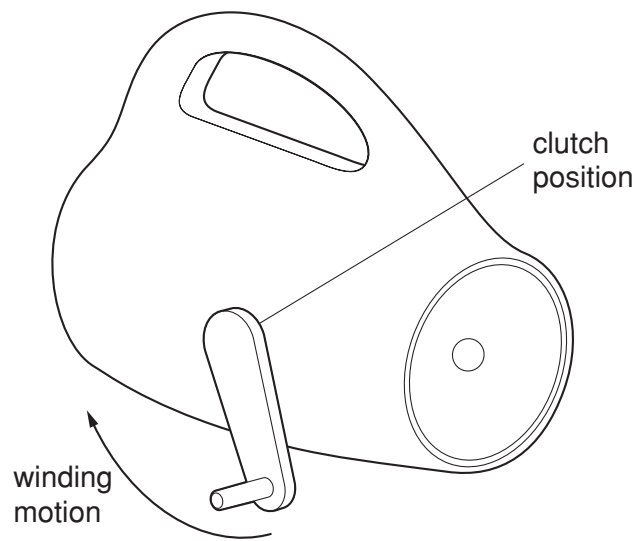


Fig. 8

The handle needs to be engaged for winding up and then disengaged to allow the torch to be used.

A dog clutch is used to engage the winding handle.

- (a) Use sketches and notes to show how a dog clutch operates.

[3]

Fig. 9 shows a cut away view of the wind up torch.

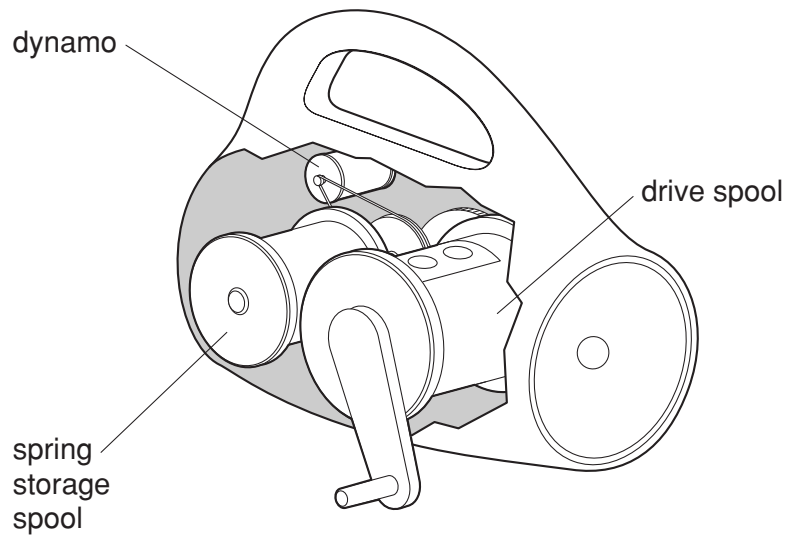


Fig. 9

(b) The energy needed to turn the dynamo is achieved by winding the spring.

(i) State the type of energy stored in the coiled spring.

_____ [1]

(ii) Describe the **three** energy transfers that take place when the torch is used.

1 _____ [1]

2 _____ [1]

3 _____ [1]

(c) Fig. 10 shows details of the gearbox used in the generating system in the torch.

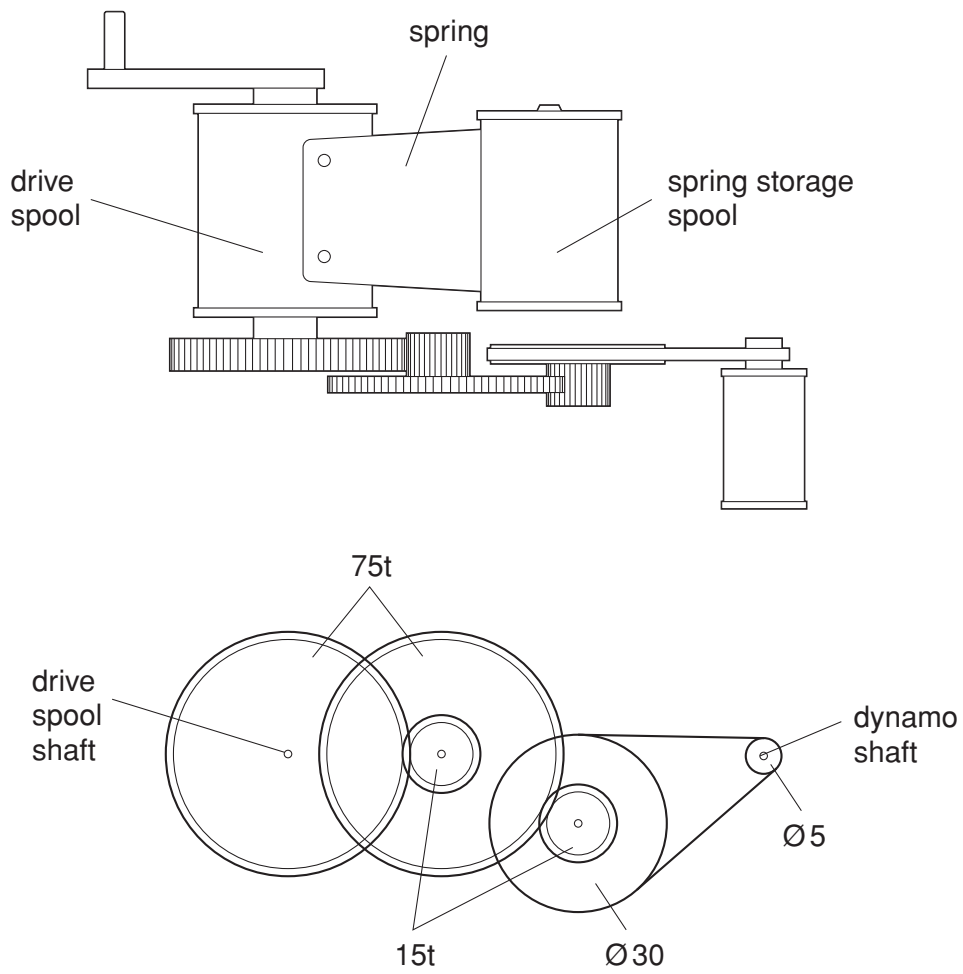


Fig. 10

Calculate the velocity ratio of this system.

[3]

- 5 Fig. 11 shows views of the clamping system used on roller skate boots.



Fig. 11

- (a) Name the mechanical system used to lock the boot.

_____ [1]

- (b) (i) Use sketches and notes to suggest how the locking system operates.

[2]

- (ii) Use sketches and notes to suggest how the size adjusting system might operate.

[2]

Fig. 12 shows a wheel and bearing assembly that has been removed from a roller skate for maintenance.

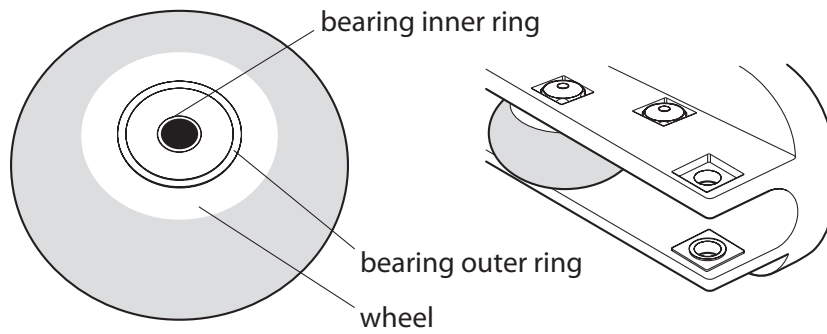


Fig. 12

- (c) Suggest a suitable bearing to be used in the wheel assembly.

[1]

- (d) Bearings need to be removed for maintenance and replacement of wheels.

Design a mechanical system that will:

- separate the bearing from the wheel with little effort;
- cause no damage to bearing or wheel;
- be able to reassemble bearing and wheel.

[4]