



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS International General Certificate of Secondary Education

and the con

1 hour

Paper 4 Systems			May/June 2008
DESIGN AND T	ECHNOLOGY		0445/04
CENTRE NUMBER		CANDIDATE NUMBER	
CANDIDATE NAME			

Candidates answer on the Question Paper.

No Additional Materials are required.

To be taken together with Paper 1 in one session of 2 hours and 15 minutes.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.

Write in dark blue or black pen.

You may use a soft pencil for any diagrams or graphs.

Do not use staples, paper clips, highlighters, glue or correction fluid.

DO NOT WRITE IN ANY BARCODES.

You may use a calculator.

Section A

Answer all questions.

Section B

Answer **one** question.

At the end of the examination, fasten all your work securely together.

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

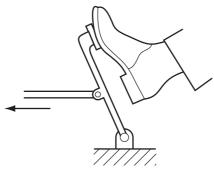
For Exam	iner's Use
Section A	
Section B	
Total	

This document consists of an 14 printed pages and 2 blank pages.

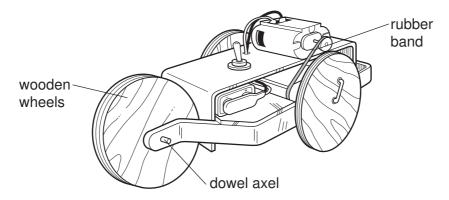


Section A

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effort;		ניו
o load; o fulcrum.	load;fulcrum.	



7 When a simple battery-powered vehicle, as shown below, is operated, energy is converted into different forms. Some forms of energy are considered energy losses.



(a) Give two energy losses for the vehicle.

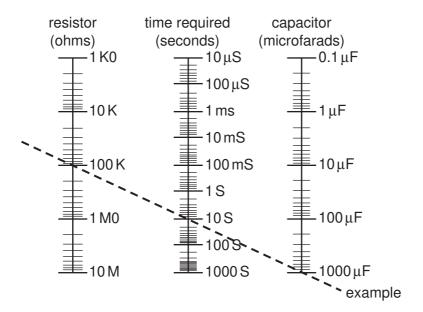
1	[1]
2	[1]

(b) (i) Give two ways of improving the energy efficiency of the vehicle.

1	 [1]	
^	F4.1	

(ii) Use sketches and notes to show **one** method for improving the energy efficiency of the vehicle.

www.papaCambridge.com 8 Using the table below, select the appropriate value of resistance, R, that gives a time of 1 second if the capacitance value is $100 \,\mu\text{F}$.



<i>R</i> =	[1	
------------	---	---	--

9	Give one example where a logic system is used in everyday life.	
10	Explain the need for a factor of safety when designing a structure.	

11 Fig. 1 shows a 555 timer circuit to control the time period for an LED.

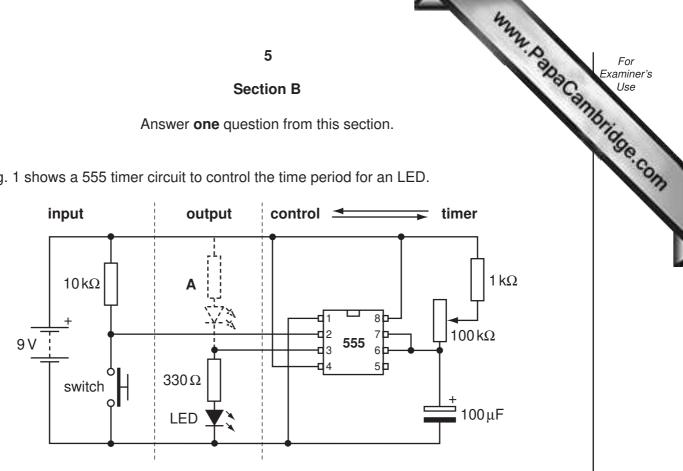


Fig. 1

(a)	Explain, step by step, the operation of the circuit.	
	[41
(b)	Explain the purpose of the 330Ω resistor.	. 1
	[[2]
(c)	Explain the effect of moving the LED to position A as outlined by the dotted lines.	
		31

(d)	The 100 μF capacitor is an electrolytic capacitor.	Use
	State why it should be connected according to its polarity.	Maridia
(e)	The value of the timing capacitor is 100 μF and the value of the timing resistor 100 $k\Omega.$	
	Calculate the time delay in seconds.	-
	1	[4]
(f)	Identify the type of switch used in the circuit shown in Fig. 1.	[1]
(g)	The circuit is powered by a 9 V battery.	
	Explain the difference between a battery and a cell.	

(h) Logic gates can be used to control circuits and systems.

www.Papa Cambridge.com Fig. 2 shows a simple circuit using two switches to simulate inputs and a lamp to sho the output.

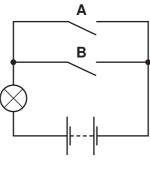


Fig. 2

(i)	State the name of the logic gate that this circuit represents.	
		[1
(ii)	Sketch the symbol for this logic gate.	
		[3]
(iii)	Identify the type of electrical arrangement of the switches in the circuit shown Fig. 2.	ı ir
		[1

(iv) Complete the truth table below for this logic circuit.

Input A	Input B	Output
0	0	
0	1	1
		1

[3]

Fig. 3 shows a design for a can-crushing press.

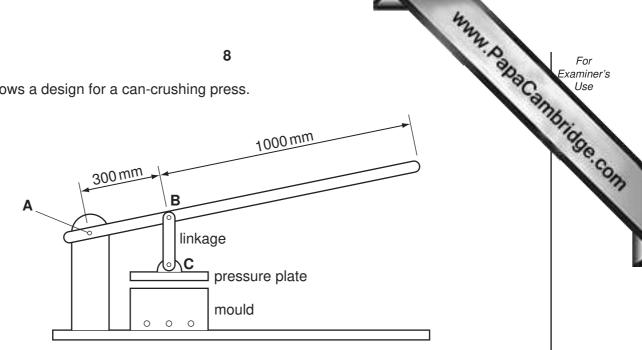


Fig. 3

(a)		ng the example of the can-crushing press, explain what is meant by the ter chanical Advantage.	m
(b)	A fo	rce of 100 N is applied at the end of the handle.	
	Cal	culate the force that is transmitted to the pressure plate.	
		I	[3]
(c)	(i)	State the type of force acting on pin A.	
			[1]
((ii)	Identify another component in the press that has this type of force acting on it.	

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(iii) Use sketches and notes to show the result of this type of force acting on a p

			[3]
(d)	Su	ggest one way in which operation of the press could be made easier.	
			[1]
(e)	lde	ntify the order of lever shown in Fig. 3.	
			[1]
(f)	It is	decided to add simple plain bearings at A, B and C.	
	(i)	Explain the need for bearings in mechanical systems.	
			[2]
	(ii)	Use sketches and notes to show a simple plain bearing.	

(g) Complete the table below.

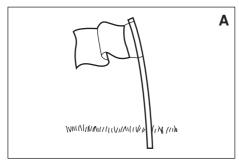
(g) Complete the table bel	10 low.	MAN, P. D.C.	For Examiner's Use
Bearing	Diagram	Example	Original Property
[1]		Bicycle	COM
Roller		[1]	

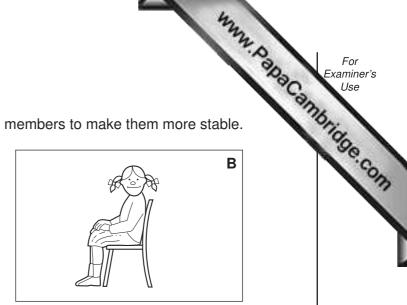
(h) Lubrication is needed in mechanical systems.

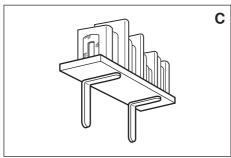
(i)	Give two reasons for lubricating mechanical systems.	
(ii)	State two types of lubricant and in each case give a specific example of use.	
	Type 1	
	Use	
		[2]
	Type 2	
	Use	
		[2]

[4]

- 13 Stability in structures is very important.
 - (a) Look at Fig. 4 and for each structure add members to make them more stable.







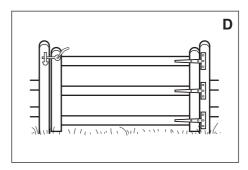


Fig. 4

(b)	Each of the above structures is subject to static and dynamic loading.		
	Explain the difference between static and dynamic loading.		
	[2]		
(c)	A typical numerical value for the factor of safety for a bridge is 4.		
	Explain why this is so.		
	[0]		

[2]

(d) Complete the table below to show different joining methods in structures.

	12	14. P	For
te the table below to sh	now different joining methods in	structures.	Use
Joining method	Diagram	Use	Orida
			For Examiner Use
Gusset plate			'
	[2]	[1]	
	r-1	1.1	
		Joining tent poles	
[1]			
Nut and bolt			

- **(e)** Laminating is a structural construction method.
 - Use sketches and notes to show the laminated structure of plywood. (i)

ii) Explain the way in which laminating improves the structural capabilities of plywood.

(f) The selection of materials is important when designing structures.

Fig. 5 shows a lintel made from concrete.

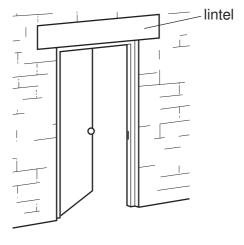


Fig. 5

(i) Use sketches and notes to show the forces acting within the lintel.

[2]

(ii) Explain, using sketches and notes, how the concrete lintel would be reinforced to make it suitable for this use.

www.PanaCambridge.com (iii) Show, using sketches and notes, how a strain gauge is used to measure the de of the lintel.

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