

GENERAL CERTIFICATE OF SECONDARY EDUCATION

DESIGN AND TECHNOLOGY

1953/04

Electronic Products

Paper 4 (Higher Tier)

Candidates answer on the Question Paper

OCR Supplied Materials:

None

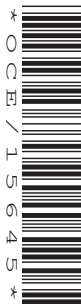
Other Materials Required:

None

Tuesday 22 June 2010

Morning

Duration: 1 hour 15 minutes



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).
- All necessary formulae are provided within the questions. No extra formulae sheet is required.

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**.
- The marks allocated and the spaces provided for your answers are a good indication of the length of answers required.
- Marks will be awarded for the use of correct conventions.
- Dimensions are in mm unless stated otherwise.
- Show all working for calculations.
- This examination paper contains a product analysis question based on the theme of **Speed Cameras**.
- This document consists of **12** pages. Any blank pages are indicated.

1 (a) Fig. 1 shows a table of products that require the use of solder in their manufacture.

(i) Complete the table in Fig. 1 to show a suitable soldering method for each product application.

Product	Soldering method / equipment
SMT (surface mount technology) PCB boards for mobile phones.	
Prototype PCB board for an egg timer project.	
'through-hole' PCB's for use in DVD video recorders.	

[3]

Fig. 1

(ii) State **two** health hazards when using 230V a.c. soldering irons.

1
 [1]

2
 [1]

- (b) There is growing concern about the pollution caused by the disposal of broken and obsolete electronic products containing lead solder.

(i) State the reason for the concern about pollution due to lead solder.

.....
 [1]

(ii) State **two** methods of reducing lead pollution.

1
 [1]

2
 [1]

(c) Fig. 2. shows two solder joints, one of which is faulty.



Fig. 2

State **two** possible causes for the faulty solder joint shown in Fig. 2.

1
 [1]

2
 [1]

[Total: 10]

2 Product Evaluation Question.

(a) Increasing numbers of speed cameras are being introduced onto our roads.

(i) Complete the table shown in Fig. 3 by choosing the correct speed camera type from the list below.

	Laser gun	Gatso	Truvelo	Specs/SVDD
Type	Description			Camera type
1	Uses radar, flash guns and a camera to photograph the back of speeding cars as they pass.			
2	Uses piezo or magnetic sensors in the road and photographs approaching cars as they pass over road markings.			
3	Uses number plate scanning to identify a vehicle and calculate its average speed over a set journey.			
4	Is portable, accurate and has a longer operating range than similar wireless radar based systems.			

[4]

Fig. 3

(ii) Both types 1 and 2 shown in Fig. 3 require a flash to illuminate the vehicle and take a photograph.

Type 1 takes the photograph from the back to prevent the flash from distracting the driver.

State the method used by type 2 that prevents the driver from being distracted by the frontal flash.

..... [1]

(iii) State the reason that makes type 2 more likely to detect a speeding motorist than type 1.

..... [1]

- (b) (i) State **one** advantage of replacing speed cameras with flashing warning signs that display the driver's speed.

.....

 [1]

- (ii) Road traffic warning signs are often placed in remote locations without access to mains electricity.

State **two** alternative energy sources that can be used to provide electrical power for traffic warning signs.

1
 [1]

2
 [1]

- (iii) Motorists can use GPS to help them identify accident black spots.

State the measure that needs to be taken to ensure the accuracy of the information about accident black spots.

.....
 [1]

[Total: 10]

3 Fig. 4 shows a 555 timer circuit used to control a light bulb.

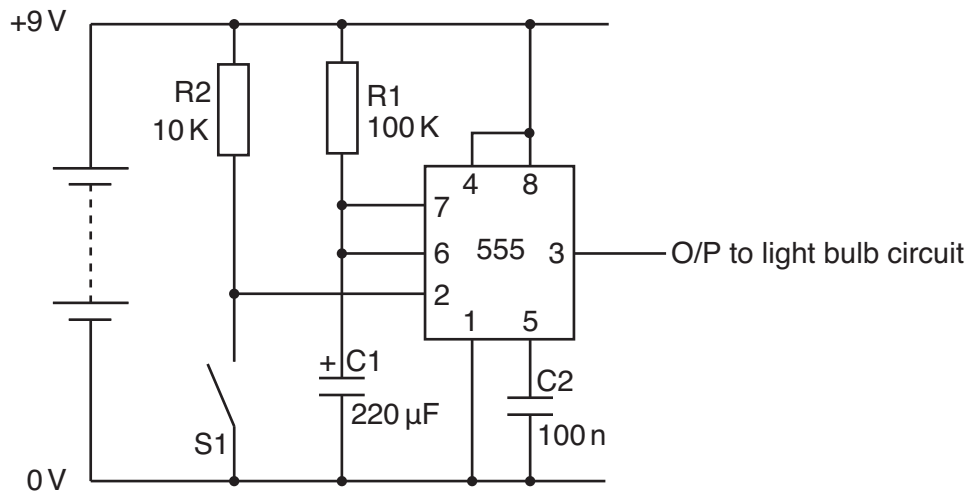


Fig. 4

(a) (i) State the type of 555 timer circuit shown in Fig. 4.

..... [1]

(ii) Calculate the timing period of the circuit shown in Fig. 4.
Use the formula $t = 1.1R_a C$

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

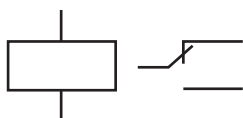
(b) (i) The O/P (output) of the circuit shown in Fig. 4 may require a buffer to drive a light bulb.

State **two** possible reasons why the circuit may require a buffer.

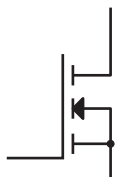
1 [1]

2 [1]

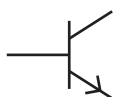
- (ii) Fig. 5 shows 3 components that could be used to buffer the output of the timer circuit. State the correct name for each type of component shown.



A [1]



B [1]



C [1]

Fig. 5

- (iii) State the precautionary measure against back emf that should be taken when using component **A**.

.....
 [1]

- (iv) State **one** advantage that component **B** has over component **C**.

.....
 [1]

[Total: 10]

4 Logic gates are available as both TTL and CMOS types.

(a) (i) State **two** ways in which CMOS power supply requirements differ to those of TTL.

1
 [1]

2
 [1]

(ii) State the meaning of 'fan out' as applied to logic gates.

.....
 [1]

(b) (i) Complete Fig. 6 to construct an AND gate using the two NAND gates shown.



Fig. 6

[1]

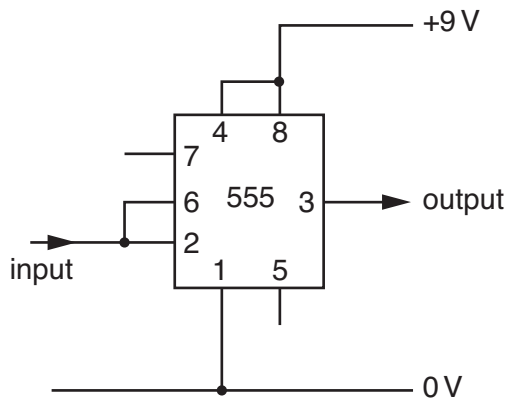
(ii) Schmitt triggers are often included in logic circuits.

State the reason for including Schmitt triggers in a logic circuit.

.....
 [1]

(c) Fig. 7 shows:

- a 555 bistable arrangement which acts as a Schmitt circuit;
- information about the switching levels of the 555;
- the waveform that is applied to the input of the circuit.



The trigger pin 2 turns the output on when it falls below $1/3$ of V_{cc} (supply voltage).

The threshold pin 6 turns the output off when it rises above $2/3$ of V_{cc} (supply voltage).

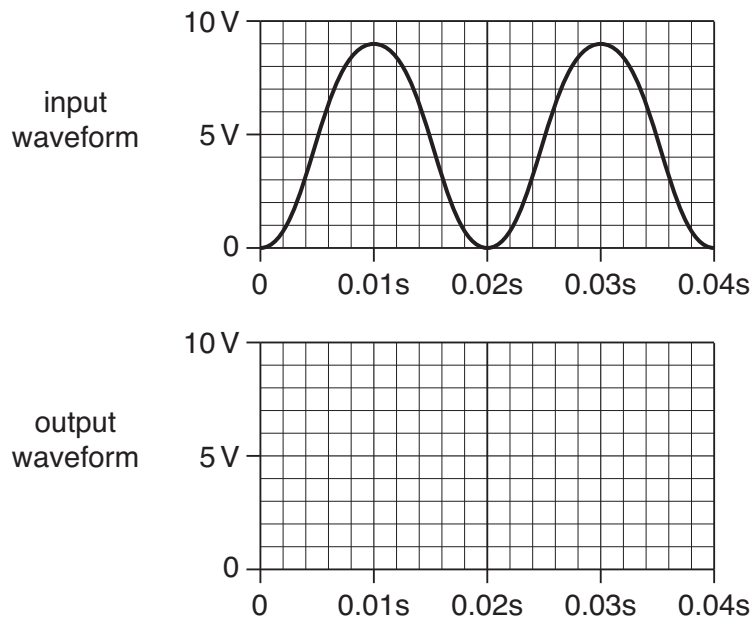


Fig. 7

- (i) Complete the graph shown in Fig. 7 to show the output waveform of the circuit. [3]
- (ii) State the type of input waveform shown in Fig. 7.
..... [1]
- (iii) State the frequency of the input waveform shown in Fig. 7.
..... [1]

[Total: 10]

- 5 (a) Fig. 8 shows an automatic night light circuit.

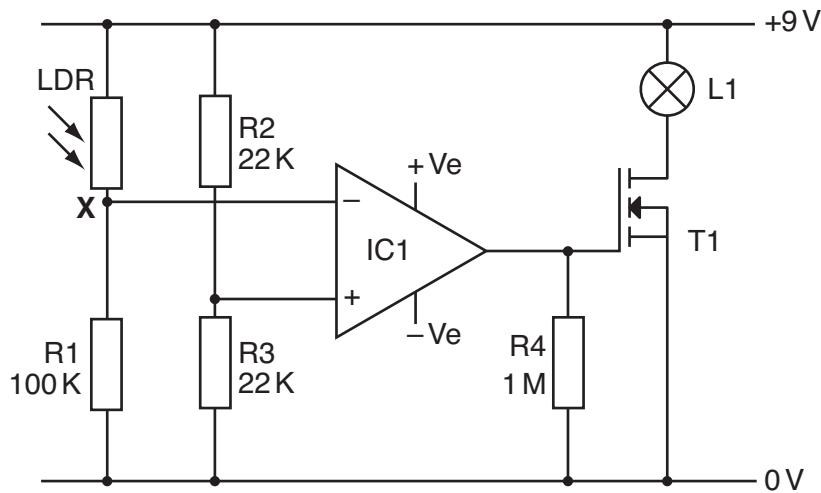


Fig. 8

- (i) State the name for the type of component labelled IC1.
 [1]
- (ii) State the voltage needed at X, below which the lamp L1 will turn on.
 [1]
- (iii) Explain why the LDR and the lamp L1 should not be placed close to one another on the device.

 [2]
- (iv) The LDR used in the circuit shown in Fig . 8 could be replaced with a photodiode.
 State how the light frequency response of a photodiode differs to that of an LDR.

 [1]
- (v) State how the response time of a photodiode differs to that of an LDR.

 [1]

(b) Electronic products manufactured and sold in the EU are subject to a number of regulations and directives; they should carry markings to show compliance with these.

(i) State the meaning of the CE mark present on all electronic products.

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

(ii) State the meaning of the BSI kite mark found on some electronic products.

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

(iii) State what is meant by RoHS legislation.

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

(iv) State how manufacturers and their products are affected by the WEEE (Waste of Electrical and Electronic Equipment) legislation.

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

[Total: 10]

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