

Candidate Name	Centre Number	Candidate Number

WELSH JOINT EDUCATION COMMITTEE  
General Certificate of Secondary Education



CYD-BWYLLGOR ADDYSG CYMRU  
Tystysgrif Gyffredinol Addysg Uwchradd

294/01

**ELECTRONICS**

**MODULE TEST E2**

**FOUNDATION TIER**

P.M. FRIDAY, 12 January 2007

(45 minutes)

**For Examiner's use only**

<b>Total Mark</b>	
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**ADDITIONAL MATERIALS**

In addition to this examination paper you may need a calculator.

**INSTRUCTIONS TO CANDIDATES**

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

Answer **all** the questions in the spaces provided in this booklet.

**INFORMATION FOR CANDIDATES**

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

No certificate will be awarded to a candidate detected in any unfair practice during the examination.

Answer **all** questions.

1. Here is a list of electronic sub-systems:

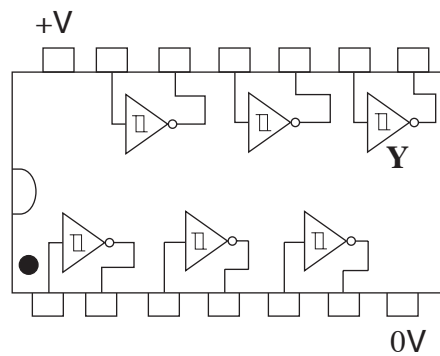
**motor      moisture sensor      MOSFET      push switch**

Insert the correct sub-system to complete the following statements.

- (a) A ..... is an **analogue** input sub-system;
- (b) A ..... is a processing sub-system;
- (c) A ..... is an output sub-system.

[3]

2. The pin-out diagram below shows a logic IC.



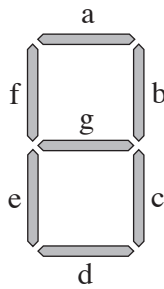
- (a) How many logic gates are contained in this IC? ..... [1]
- (b) How many inputs does each gate have? ..... [1]
- (c) Label pin 1 with the number 1. [1]
- (d) Give the number of the pin connected to the output of gate Y. .... [1]
- (e) What is the name given to the type of logic gate contained in this IC?

Choose from the following list:

**OR      NAND      NOT      SCHMITT INVERTER**

..... [1]

3. The diagram shows the arrangement of the LEDs in a seven-segment display.

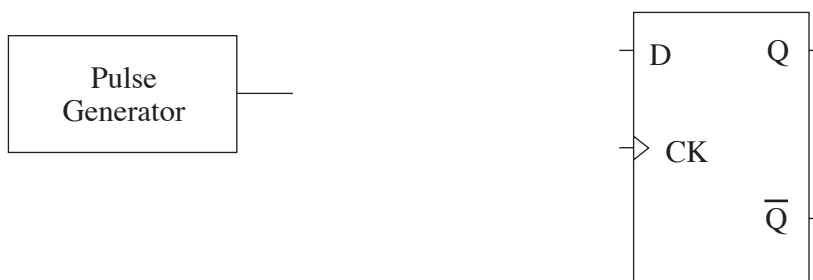


Complete the following table, which shows the number/letter displayed when different segments are lit.

Segment							Letter/Number displayed
a	b	c	d	e	f	g	
1	0						<b>F</b>
							<b>3</b>
0	1	1	0	1	1	1	

[3]

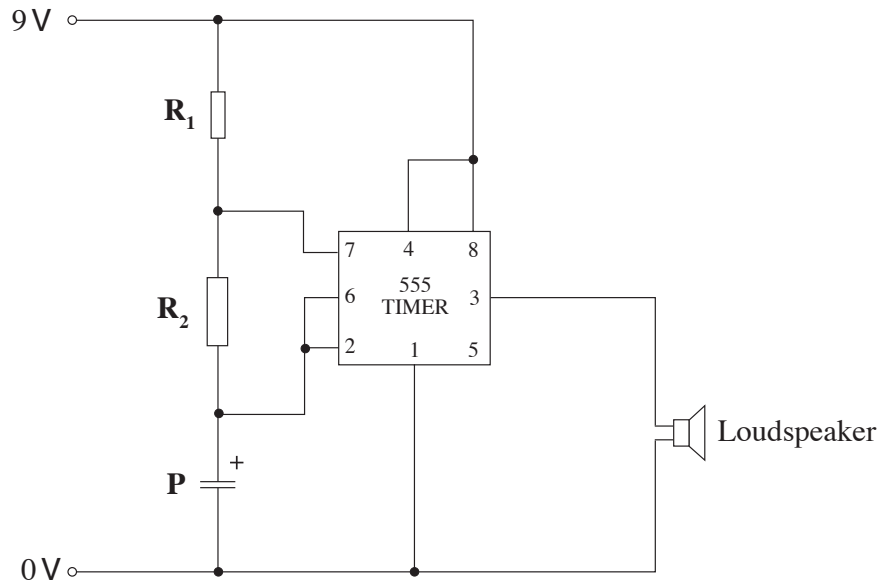
4. The diagram shows a pulse generator and a D-type flip-flop.



(a) The D-type must be connected so that it performs a *divide-by-two* action on pulses from the pulse generator.  
Draw the two connections needed to do this. [2]

(b) The frequency of the signal at the Q output is 200 Hz.  
What is the frequency of the pulse generator? ..... [1]

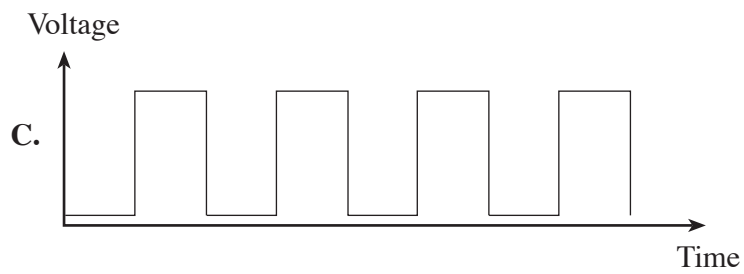
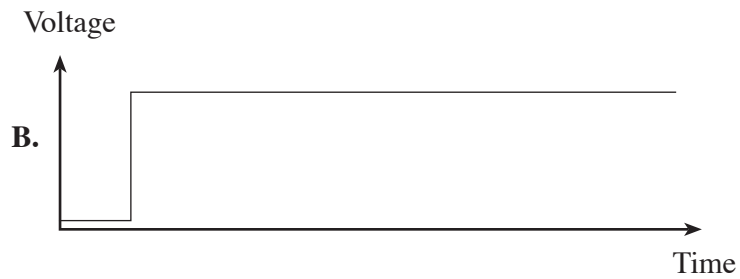
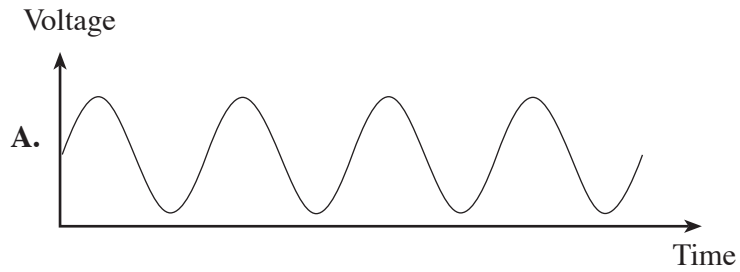
5. Here is the diagram for an astable circuit based on a 555 timer IC.



(a) Name the component labelled **P**. .....

[1]

(b) Which of the following is the output waveform produced by an astable circuit?



Answer .....

[1]

(c) (i) The value of  $R_2$  is increased. What happens to the frequency of the output signal?

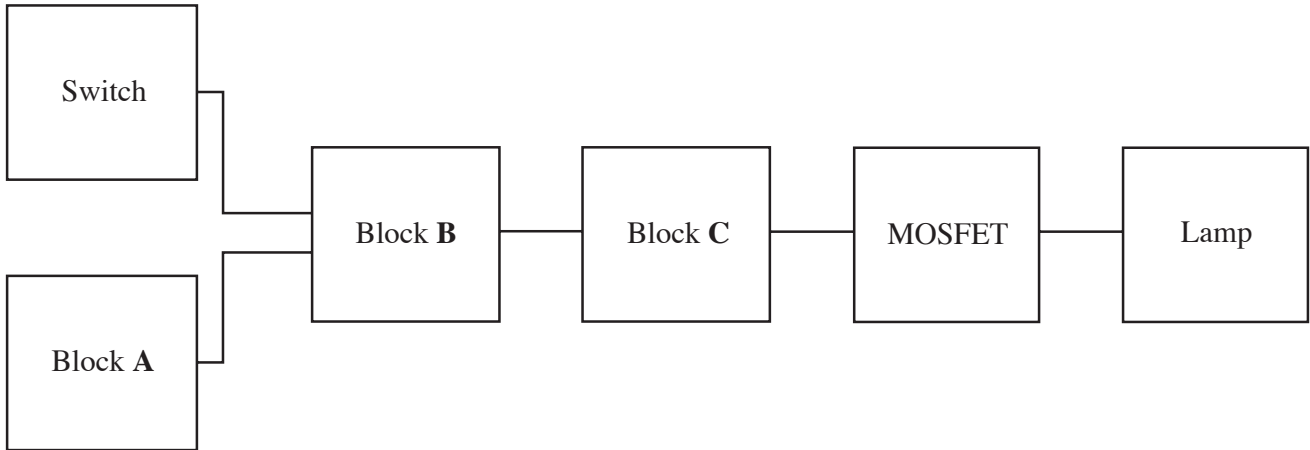
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(ii) The value of component  $P$  is increased. What happens to the frequency of the output signal?

.....

[2]

6. (a) Here is a system that controls a lamp on a stairway. The lamp comes on when the switch is pressed **but only** if it is dark. The lamp switches off automatically after 1 minute.



You can choose any of the following sub-systems to use for blocks **A**, **B** and **C**:-

- Temperature sensing unit
- Light sensing unit
- OR gate
- Delay unit
- Pulse unit
- AND gate

Which sub-system is

- (i) a suitable unit for block **A**? .....
- (ii) a suitable unit for block **B**? .....
- (iii) a suitable unit for block **C**? ..... [3]

- (b) The above system is an example of electronics being used in the home.

- (i) Describe **another** use of electronics in the home.

.....

.....

- (ii) Describe **one** benefit of electronics to a hospital patient.

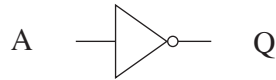
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[2]

7. (a) Write the name of each logic gate in the space provided and complete the truth tables.

(i) Gate 1



A	Q
0	
1	

Name of gate: .....

(ii) Gate 2

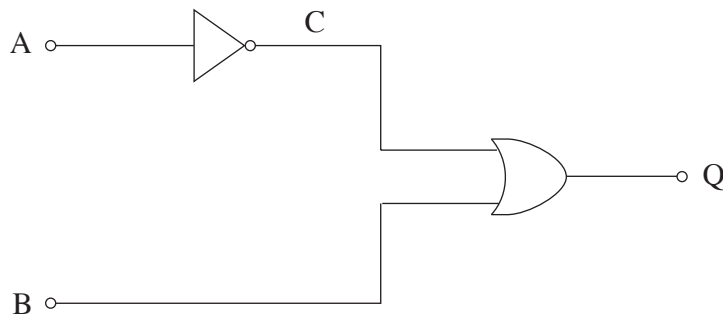


A	B	Q
0	0	
0	1	
1	0	
1	1	

Name of gate: .....

[4]

(b) Complete the truth table for the following logic system.



A	B	C	Q
0	0		
0	1		
1	0		
1	1		

[2]

8. A logic system has two input sensors A and B, and three outputs P, Q and R. The truth table showing how the input sensors control the outputs is shown below.

B	A	P	Q	R
0	0	0	1	1
0	1	0	0	1
1	0	0	0	0
1	1	1	0	0

- (a) (i) Look at the P output. Which type of logic gate will provide this?

Logic gate is .....

- (ii) Look at the Q output. Which type of logic gate will provide this?

Logic gate is .....

- (iii) Look at the R output. It is the inverse of one of the inputs.  
Write down an expression to describe this output.

R = .....

[3]

- (b) You have a selection of AND, OR, NOT, NOR and NAND gates available.  
Draw a labelled diagram to show how the logic system can be made.

A ○—

—○ P

—○ Q

B ○—

—○ R

[3]

- (c) A memory IC could be used to give the same output as the logic system. Give one advantage, other than cost, of designing an electronic system using a memory IC instead of logic gates. [1]

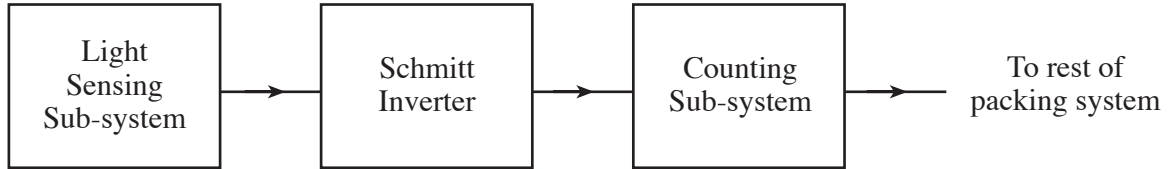
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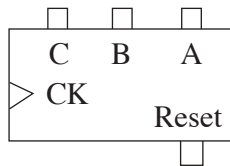
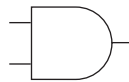
9. A company packs DVDs into boxes, five to a box.

Part of the packing system is shown in the following block diagram.



- The counting sub-system contains a 3-bit binary counter and an AND gate
- The system must reset when the **fifth** DVD passes the light sensor
- Taking the reset pin to logic 1 resets the counter
- Bit A of the counter is the least significant bit
- The counter is initially reset

(a) Complete the diagram below to show how the AND gate is connected to the counter to allow it to reset correctly.



[3]

(b) Why is a Schmitt Inverter needed in **this** system?

[1]

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