WELSH JOINT EDUCATION COMMITTEE

General Certificate of Secondary Education

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294/01

ELECTRONICS

MODULE TEST E2

FOUNDATION TIER

P.M. THURSDAY, 12 January 2006

(45 minutes)

For Examiner's use only

Total Mark	

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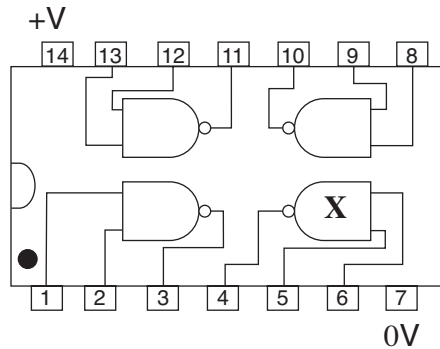
1. Here is a list of electronic sub-systems:

> **latch   motor   light sensor   tilt-switch**

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

(a) A .... is a **analogue** input sub-system;

(b) A .... is a processing sub-system;

(c) A .... is an output sub-system.

[3]

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

(a) How many logic gates are contained in this IC?   ....

(b) How many inputs does each gate have?   ....

(c) Give the number of the pin connected to the output of gate **X**.   ....

(d) What is the name given to the type of logic gate contained in this IC?

Choose from the following list:

> **AND   OR   NOT   NAND   NOR**

....

[4]

3. The block diagram shows a heating system for an aquarium.
The heater comes on when the water temperature drops too low.

| Temperature Sensing Unit | → | Schmitt Inverter | → | Transducer Driver | → | Heater |
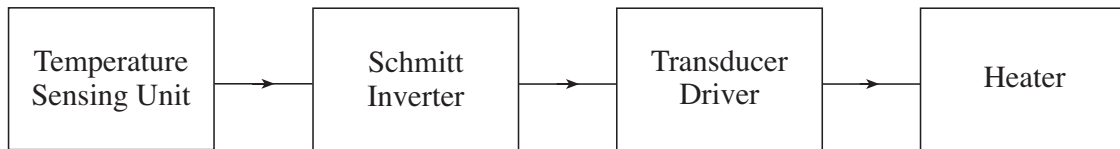
(a) Which sub-system is most likely to have a control to make the heater turn on at different temperatures?

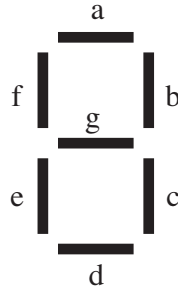..
[1]

(b) Give **two** reasons for using the Schmitt Inverter in this system?

(i) ....

(ii) ....
[2]

Turn over.

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

A simple temperature meter uses this display to indicate three temperature levels.
The letter **H** is displayed when the temperature is too hot and the letter **C** displayed when it is too cold.

Complete the following table to show:

- which segments are lit when the letter **H** is displayed;

- which segments are lit when the letter **C** is displayed;

- which letter is displayed when segments a to g contain the code **1011011**.

Segment							Letters or Number displayed
a	b	c	d	e	f	g	
0							**H**
							C
1	0	1	1	0	1	1	

[3]

5. A *555* timer can be used in both a monostable and an astable circuit depending on which way external components are connected.
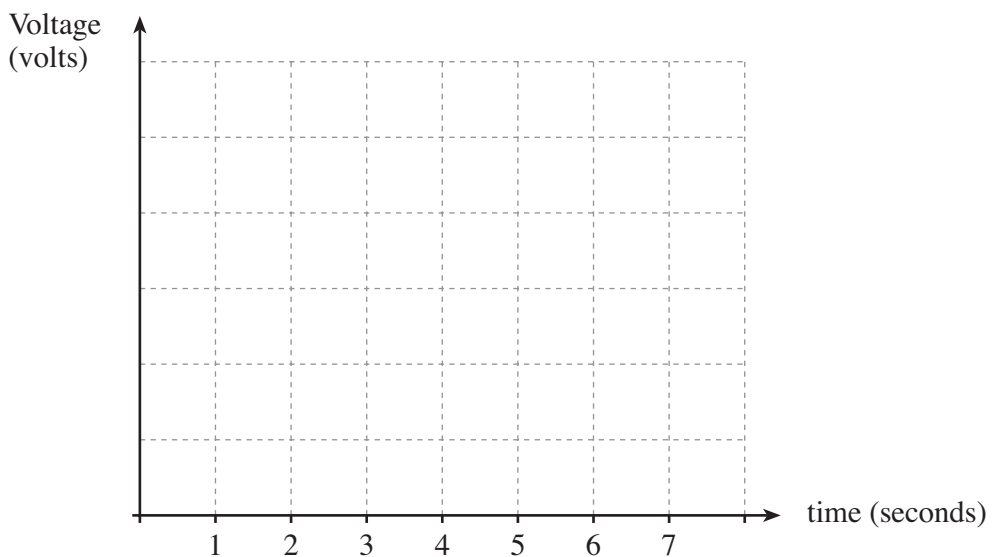
(a) A *555-astable* circuit produces the output signal shown below.
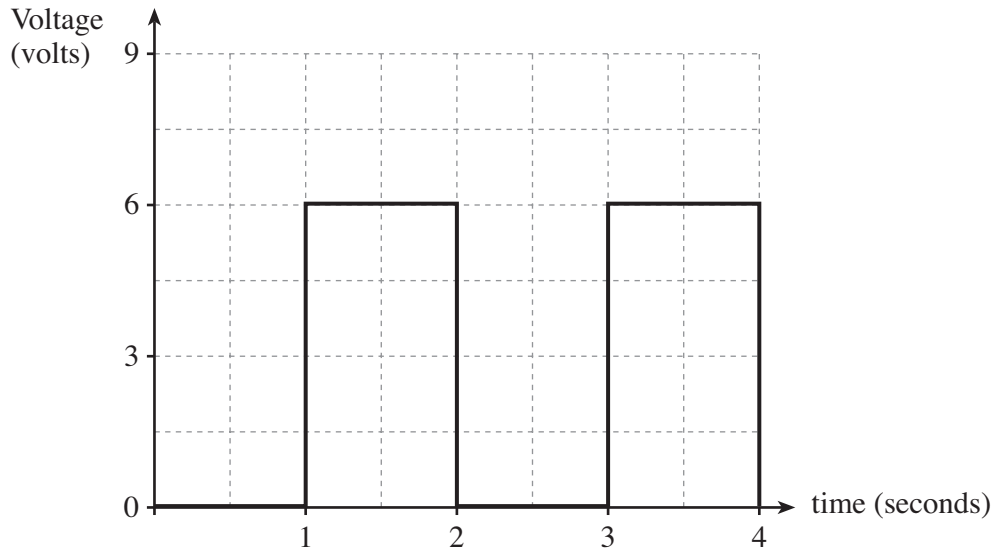
(i) What is the amplitude of the signal? ....

(ii) What is the period of the signal? ....

(iii) Give a use for a *555-astable* circuit.

....

[3]

(b) (i) Complete the graph below to show the output signal produced by a *4 second monostable* circuit when it is triggered at time = 2 seconds. [3]
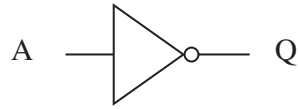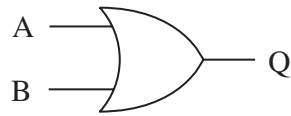

(ii) Give a use for a *555-monostable* circuit.

....

[1]

Turn over.

6. *(a)* Complete the truth table for the following logic gates.

(i) NOT

A	Q
0	
1	

(ii) OR

A	B	Q
0	0	
0	1	
1	0	
1	1	

[2]

(b) Complete the truth table for the following logic system.
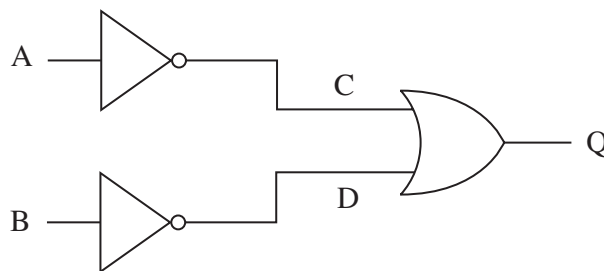
A	B	C	D	Q
0	0			
0	1			
1	0			
1	1			

[3]

7. The following diagram shows a thyristor circuit.
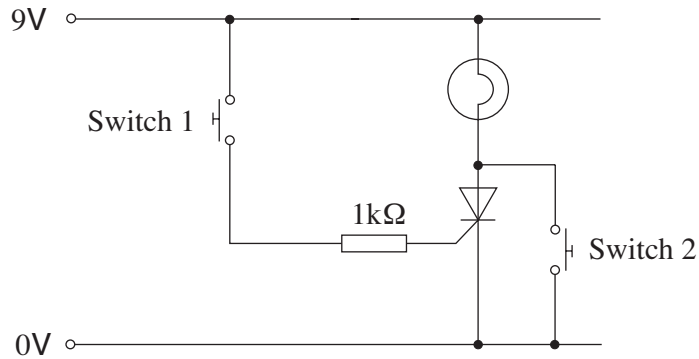
The switches are operated in the order shown below.
State whether the bulb is *on* or *off*. The first one is done for you.

- Switch 1 is closed. The bulb is **on**.

- Switch 1 is opened. The bulb is   ....

- Switch 2 is closed. The bulb is   ....

- Switch 2 is opened. The bulb is   ....   [3]

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

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

(b) The Pulse Generator frequency is 20Hz.

(i) What is the frequency of the signal at the Q output? ....

(ii) What is the frequency of the signal at the $\overline{Q}$ output? .... [2]

Turn over.

9. A disco lighting kit flashes seven lamps on and off in a planned sequence. The diagram shows this sequence.

First pattern in sequence

Lamp on

Lamp off

Last pattern in sequence
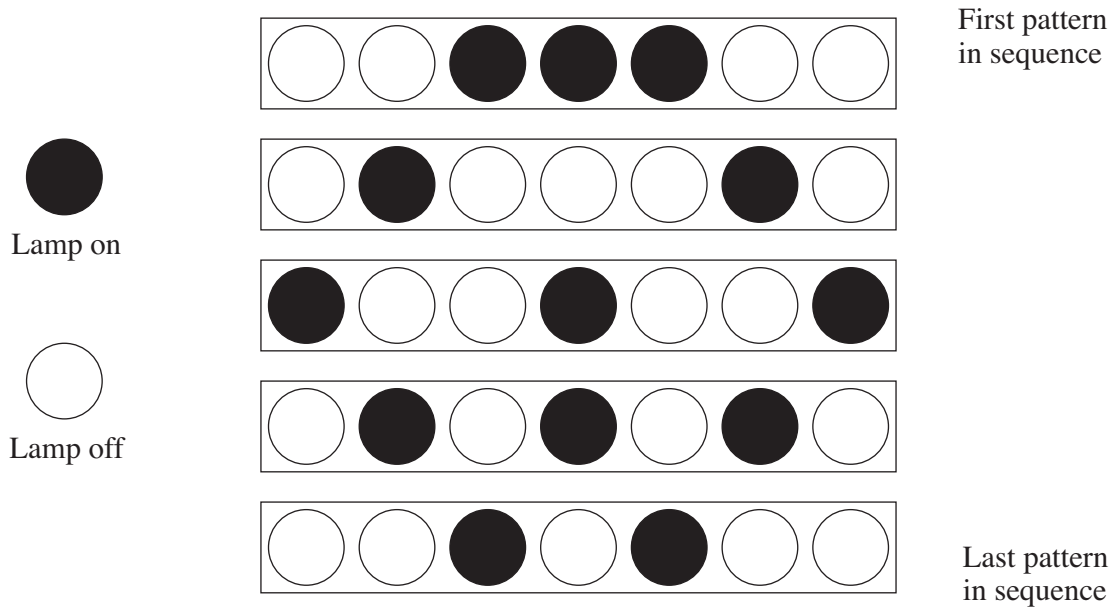
A memory IC stores the sequence.

(a) The memory IC has seven data lines and three address lines.

What is the maximum number of sequence steps that can be stored in the IC?
Choose your answer from the following

     5   8   11   16   35

.... [1]

(b) Complete the table below with the series of binary codes to store the sequence.

Memory Address	Memory Contents						
	D0	*D1*	*D2*	*D3*	*D4*	*D5*	*D6*
000	0	0	1	1	1	0	0
001							
010							
011							
100							
101	Unused						

[3]

(c) A 3-bit counter is connected to the memory IC. As the counter outputs change, each memory location is accessed in turn. The counter must be reset at the end of the sequence to allow the patterns to repeat.

(i)   What is the **binary** memory address of the first unused memory location? ....

[1]

(ii) Complete the diagram below to show how the counter can be reset.
Bit A of the counter is connected to the least significant bit of the memory address.

[3]