

Candidate Name	Centre Number	Candidate Number
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GCSE

294/01

ELECTRONICS

MODULE TEST E2

FOUNDATION TIER

P.M. FRIDAY, 6 June 2008

45 minutes

For Examiner's use only

Total Mark	
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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.

Answer all questions.

1. There are three types of electronic subsystem, known as *Input*, *Process* and *Output*.

Here is the block diagram for a door-entry alarm. It warns a shopkeeper when someone enters the shop.



- (a) What kind of sub-system is the Switch Unit – Input, Process or Output?

.....

[1]

- (b) What kind of sub-system is the Delay Unit – Input, Process or Output?

.....

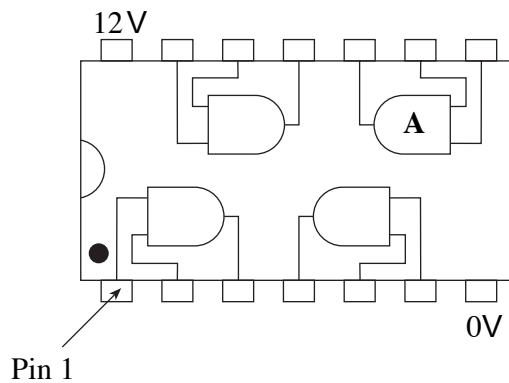
[1]

- (c) Choose a suitable device for block X from the following list of sub-systems:

Comparator AND gate Buzzer Pulse Generator

[1]

2. The diagram shows the pin-out for an IC (integrated circuit).



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

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

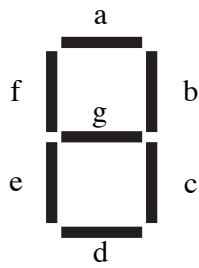
- (c) Pin 1 is labelled.

- (i) What is the pin number for the 0V pin?

- (ii) What is the pin number for the output of gate A?

[4]

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

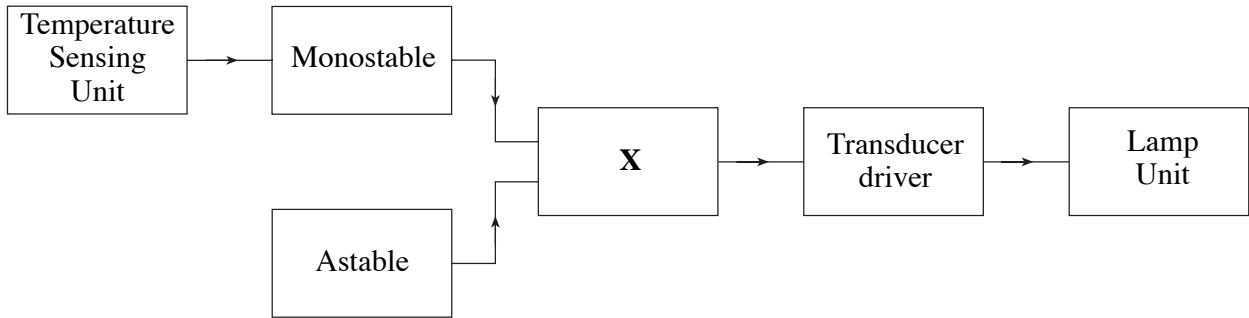


Complete the following table.

Segments							Number Displayed
a	b	c	d	e	f	g	
1	1	1					7
1	1	1	1	0	0	1	

[2]

4. Here is the block diagram for a freezer alarm.



The lamp does not light when the freezer is cold enough.
 The lamp flashes on and off repeatedly when the freezer is too hot.
 The monostable outputs a logic 1 signal for 30 s when the freezer gets too hot.

(a) What type of logic gate is required in block X? [1]

Answer

(b) What is the job of the astable in this system?

Choose one of the following answers:

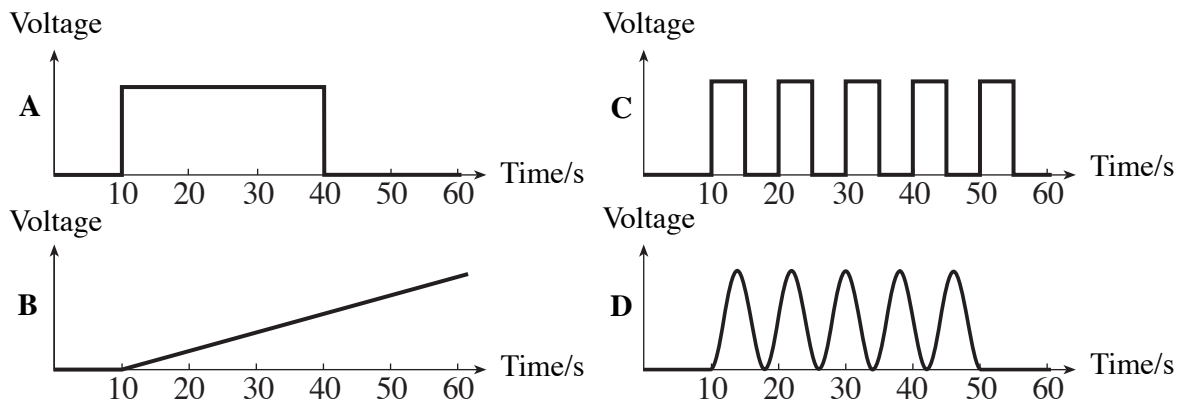
- A. It makes the Lamp Unit pulse on and off over and over again.
- B. It outputs a steady logic 1 signal when the freezer gets too hot.
- C. It keeps the Lamp Unit switched on for 30 s and then switches it off automatically.
- D. It buffers the output of the monostable, providing enough current to light the lamp.

[1]

Answer

(c) The temperature in the freezer rises and triggers the monostable.

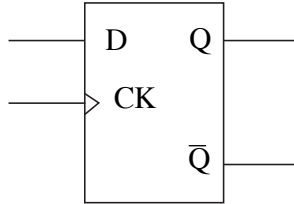
Which of the following shows the output signal from the monostable?



[1]

Answer

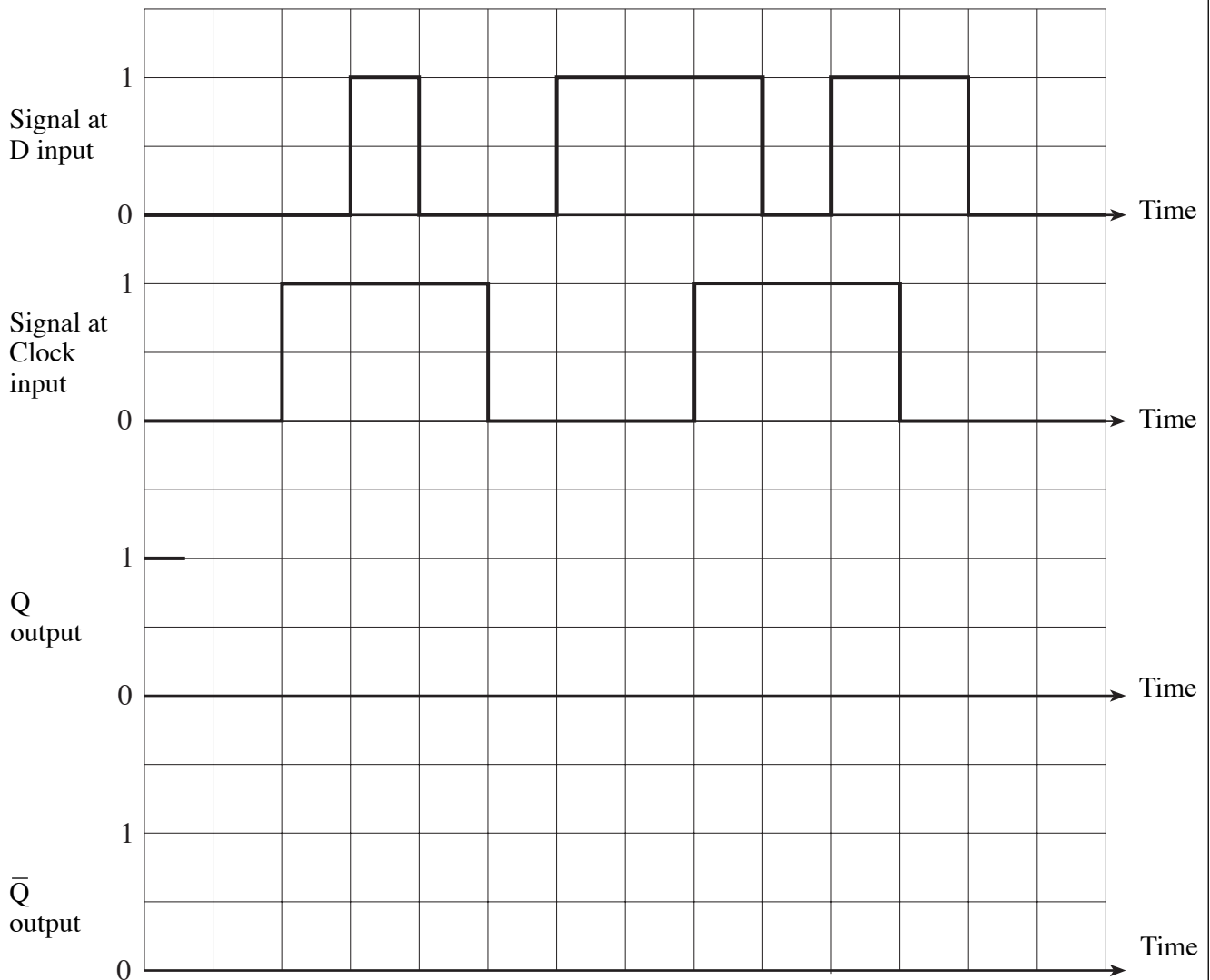
5. The D-type flip-flop can be used for data transfer, under the control of the clock. The D-type flip-flop is rising-edge triggered.



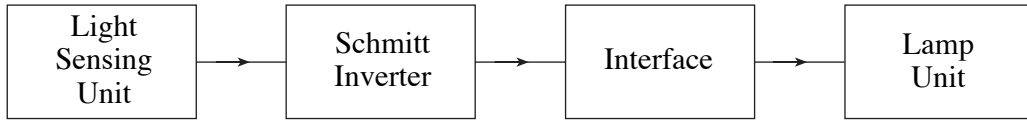
The signal shown in the first graph is sent into the D input.
The second graph shows the pulses sent into the clock input.
Use the axes provided to draw the signals at the Q and \bar{Q} outputs.

The Q output is initially at logic 1.

[3]



6. The block diagram shows the design of a security light, which turns on automatically when it gets dark.

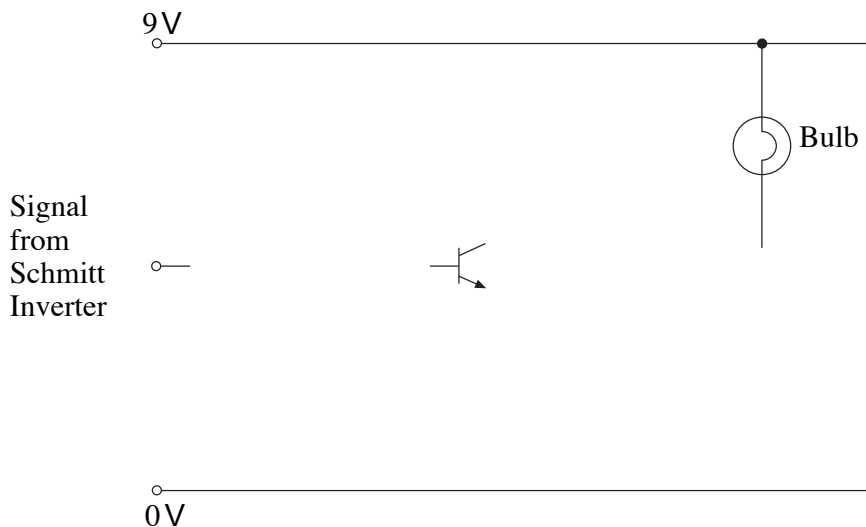


- (a) The lamp comes on when it gets dark. Which block detects the light level?
 [1]

- (b) The Light Sensing Unit gives out a logic 0 signal in the dark.
 (i) The Schmitt Inverter inverts the signal from the Light Sensing Unit. Explain what this sentence means. [1]
-

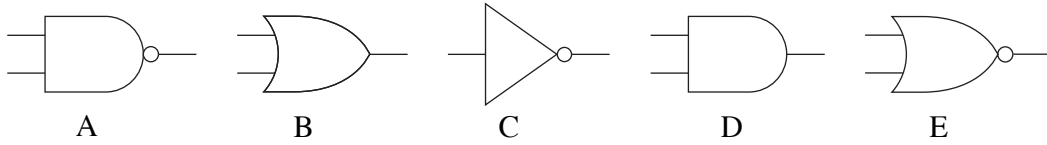
- (ii) What is the other use of the Schmitt Inverter in this system? [1]
-

- (c) The circuit diagram shows part of the interface.
 (i) Add a resistor to limit the base current into the transistor.
 (ii) Draw the connections needed to complete the circuit diagram. [3]



- (d) A thyristor is often used as an interface device. Why is it **not** suitable in this system? [1]
-

7. (a) Here are five logic gate symbols:



Complete the table to match the logic symbols and their names.

[3]

Logic gate name	Correct symbol, A, B, C, D or E
AND gate	
NAND gate	
NOR gate	
NOT gate	
OR gate	

(b) Complete the truth tables for the following logic gates:

(i) a **NOT** gate

[1]

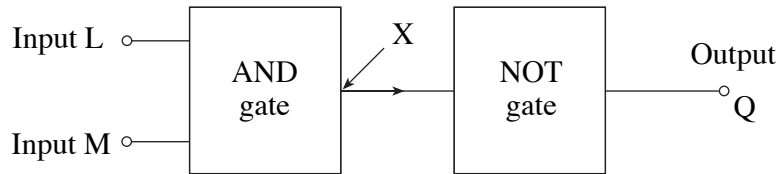
Input	Output
0	
1	

(ii) an **AND** gate

[1]

Inputs		Output
0	0	
0	1	
1	0	
1	1	

(c) A **NOT** gate and an **AND** gate are connected together as shown in the block diagram.



(i) Complete the following truth table for this system:

L	M	X	Q
0	0		
0	1		
1	0		
1	1		

[2]

(ii) Name the single logic gate which produces the same effect as this logic system.

.....

[1]

8. An electronic 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	1	1	0
1	0	0	0	0
1	1	1	0	0

- (a) Which of the following expressions correctly describes the **P** output? [1]

A NOT A B NOT B

Answer

- (b) Which of the following expressions correctly describes the **Q** output? [1]

A NOT A B NOT B

Answer

- (c) Complete the following diagram to show how the **R** output can be obtained using a single logic gate. [1]



- (d) **Another** electronic system uses a memory IC rather than logic gates to control output devices from input sensors.

The memory IC has 4 address pins and 8 data pins.

- (i) How many separate output devices can be connected to the memory IC?

.....

[1]

- (ii) Which of the following gives the number of memory locations on the memory IC?

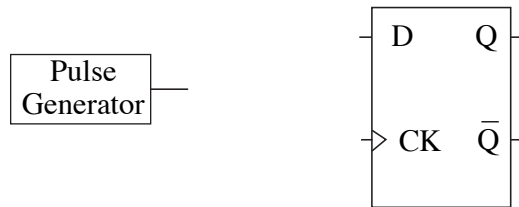
4 8 12 16

Answer

[1]

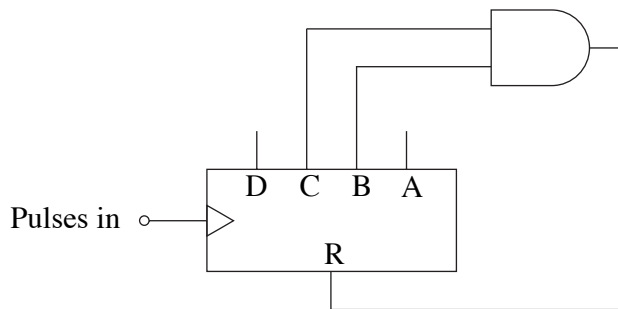
9. A binary counter can be built from a series of D-type flip-flops, or can be obtained as a dedicated counter IC.

(a) The diagram shows a pulse generator and a **rising-edge** triggered D-type flip-flop.



Draw on the diagram the **two** connections required to convert the D-type into a one-bit counter, connected to the pulse generator. [2]

(b) The next diagram shows a counter IC, with its reset controlled by an AND gate.



Complete the table to show the sequence of outputs produced, including the effect of the AND gate. [3]

Pulse number	Counter outputs		
	C	B	A
0	0	0	0
1			
2			
3			
4			
5			
6			
7			