

STUDENT NUMBER

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CENTRE NUMBER

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HIGHER SCHOOL CERTIFICATE EXAMINATION

1999

INDUSTRIAL TECHNOLOGY

2 UNIT

SECTION II

ELECTRONICS INDUSTRIES

*Total time allowed for Sections I and II—One hour and a half
(Plus 5 minutes reading time)*

DIRECTIONS TO CANDIDATES

- Write your Student Number and Centre Number at the top right-hand corner of this page.
- Where appropriate, show all working for solutions neatly and clearly.
- You may use Board-approved drawing instruments and calculators.

Section II—Electronics (15 marks)

- Question 4 is COMPULSORY.
- Attempt TWO questions from Questions 5, 6 and 7.
- Answer the questions in the spaces provided in this paper.

MARKER'S USE ONLY

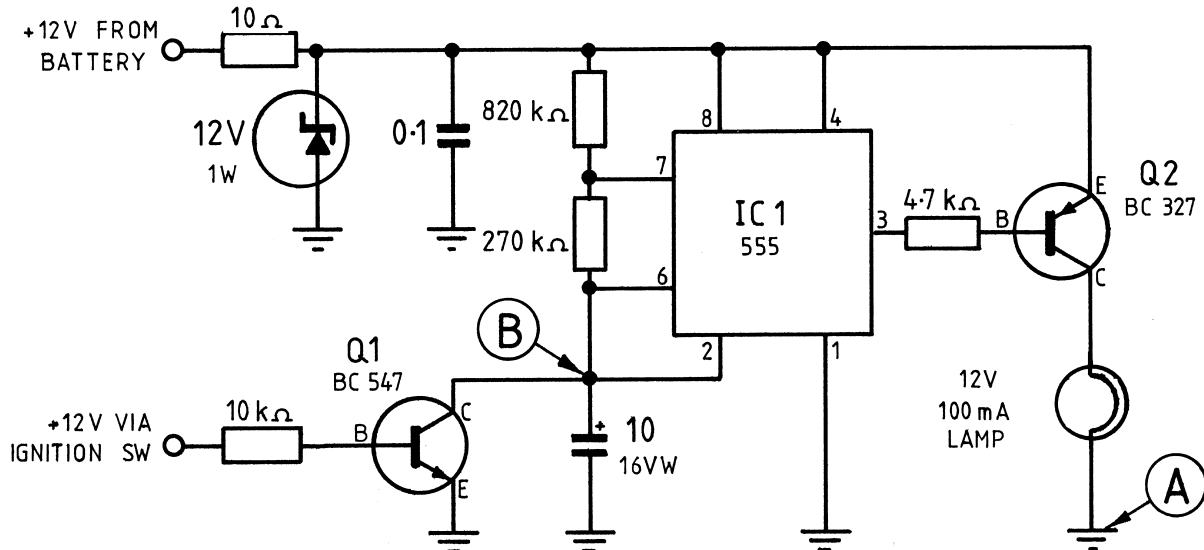
Question				
4				
5				
6				
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SECTION II—ELECTRONICS

(15 Marks)

QUESTION 4 This question is COMPULSORY. (5 marks)

The circuit in Figure 1 controls a flashing lamp on the dashboard of a car that forms a part of an alarm system.



<i>Parts list</i>
Printed circuit board
55 timer IC
BC 547 transistor
BC 327 transistor
12 V 1 W zener diode
10 μ F 16 V W electrolytic capacitor
0.1 μ F greencap
10 Ω 0.5 W resistor
820 k Ω 0.25 W resistor
270 k Ω 0.25 W resistor
10 k Ω 0.25 W resistor
4.7 k Ω 0.25 W resistor

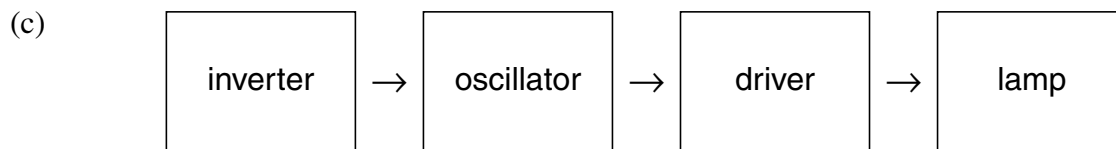
FIG. 1

QUESTION 4 (Continued)

- (a) (i) On Figure 1, clearly label the zener diode using the label D1.
 - (ii) There are two transistors shown in this circuit. Is Q1 a PNP or an NPN transistor?
Q1
 - (iii) The pins on the 555 IC are not shown in their actual positions. Why is it drawn this way?
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.....
.....
 - (iv) What is the meaning of the symbol labelled (A) in the diagram?
.....
 - (v) What is the meaning of the dot at point (B) in the diagram?
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- (b) The board has a finished size of 30 mm × 50 mm. A sheet of photo-sensitive circuit board is 250 mm × 300 mm and costs \$16.

Calculate the cost of the circuit board material to produce one of these boards.

\$



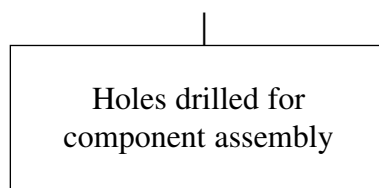
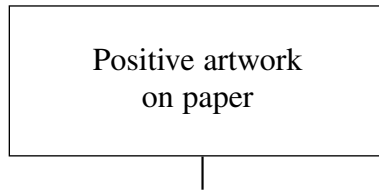
BLOCK DIAGRAM

Refer to the block diagram. Explain how the alarm flasher will work.

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QUESTION 4 (Continued)

- (d) Complete the flowchart to show the process of manufacturing a PCB using photo-sensitive circuit board. Use the space below.



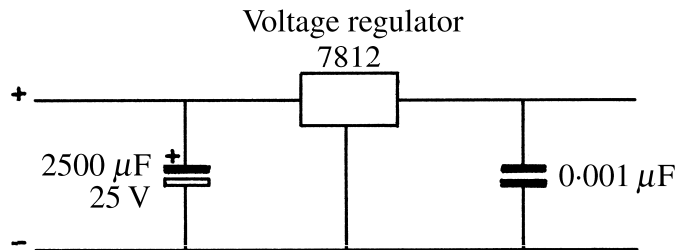
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Attempt TWO questions from Questions 5, 6 and 7.

QUESTION 5 (5 marks)

A simple filter circuit for a car radio is shown below.



- (a) Why is a bridge rectifier unnecessary in this power supply?

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- (b) (i) Explain the function of the voltage regulator in this circuit.

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- (ii) What is the function of the 2500 μF capacitor?

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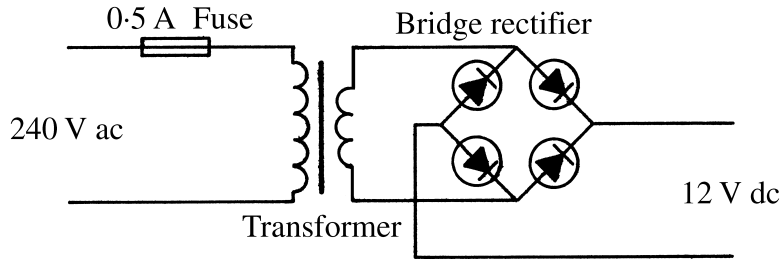
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QUESTION 5 (Continued)

- (c) A power supply that is converting 240 V ac (alternating current) to 12 V dc (direct current) contains a transformer and a rectifier.



- (i) Describe the function of the transformer.

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- (ii) Explain the benefit of a full-wave rectifier (bridge rectifier) over using a single diode as a rectifier.

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- (iii) This power supply has a half-ampere fuse on the 240 V input.

What is the maximum current it can supply at 12 V?

Maximum current A

QUESTION 6 (5 marks)

(a) In the process of constructing an electronics project some fault-finding procedures need to be undertaken.

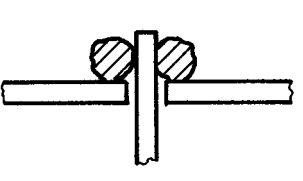
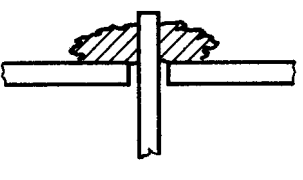
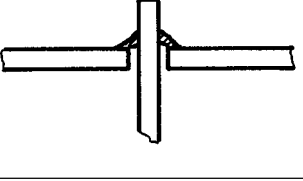
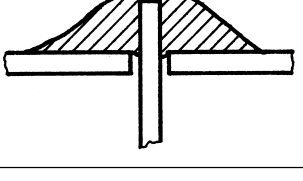
(i) Before checking for faulty soldering, which of the following tests would you perform? (Circle the letter that relates to the correct answer.)

(A) Use a multimeter to follow the voltage path through the circuit.

(B) Check component placement and orientation.

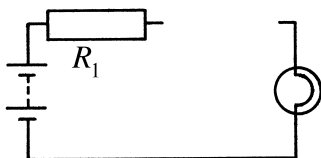
(C) Check with a logic probe.

(ii) Below are shown some faulty solder joints. For each diagram explain why the fault occurred.

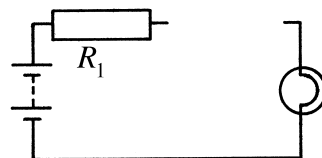
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(b) Complete the following circuits to show how the multimeter is used to test:

(i) Current flow through R_1



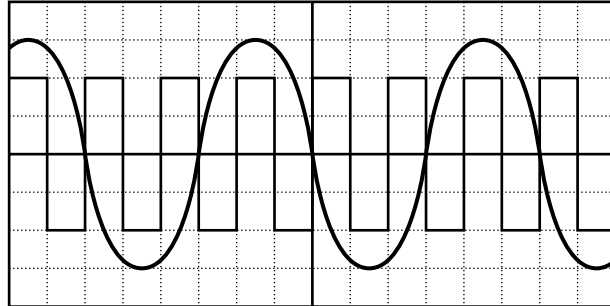
(ii) Voltage across R_1



QUESTION 6 (Continued)

(c) Many audio circuits would need a cathode ray oscilloscope (CRO) to be used for testing.

The diagram below shows two waveforms on a CRO screen.



The controls on the CRO are set as follows:

sweep — 1 μ s/cm

volts/cm — 2 V/cm

(i) What is the frequency of the square wave?

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(ii) What is the peak voltage of the sine wave?

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(iii) The waveforms shown were generated by a signal generator. Explain how these signals are used for testing electronic circuits.

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QUESTION 7 (5 marks)

(a) In terms of voltage, explain the basic difference between digital and analogue electronic principles.

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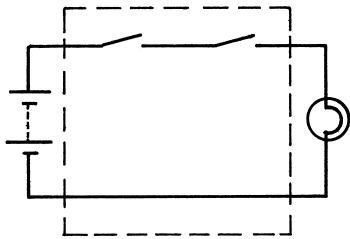
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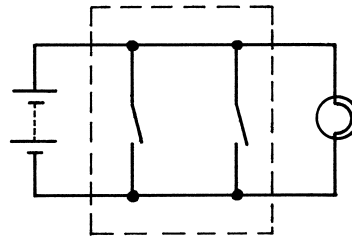
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(b) Digital logic gates can be easily represented by switches.

(i) Name the gates represented by the two circuits below.



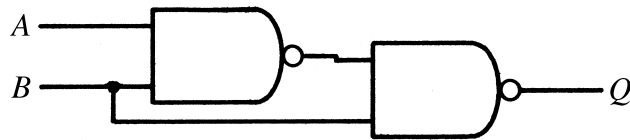
Gate



Gate

(ii) Truth tables are used to help determine the output state for a combination of input states.

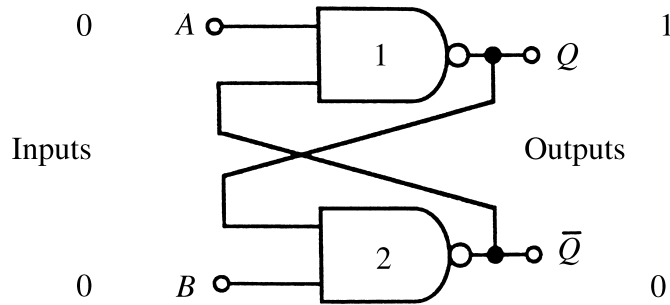
Complete the truth table for the circuit shown below.



<i>A</i>	<i>B</i>	<i>Q</i>
0	0	
0	1	
1	0	
1	1	

QUESTION 7 (Continued)

(c) Below is a circuit for an RS flip-flop.



What is the main difference between the RS flip-flop and a simple logic gate?

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(d) Wave soldering and reflow soldering are two mass production techniques.

Describe ONE of these processes. In your answer, indicate if it is used for *through hole* or *surface mount* components.

Soldering technique

Component type

Description

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(e) Many digital ICs are of the CMOS type. These can be easily damaged by static electricity. List TWO precautions to be observed when handling CMOS devices.

(i)

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(ii)

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