

GCSE
D&T: ELECTRONIC PRODUCTS

Paper 4 (Higher Tier)

WEDNESDAY 13 JUNE 2007

H **1953/4**

Afternoon

Time: 1 hour 15 minutes

Candidates answer on the question paper.
No additional materials are required.



Candidate
Name

Centre
Number

--	--	--	--	--

Candidate
Number

--	--	--	--

INSTRUCTIONS TO CANDIDATES

- Write your name, Centre number and Candidate number in the boxes above.
- Answer **all** the questions.
- Use blue or black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure you know what you have to do before starting your answer.
- Do **not** write on the bar code.
- Do **not** write outside the box bordering each page.
- **WRITE YOUR ANSWER TO EACH QUESTION IN THE SPACE PROVIDED. ANSWERS WRITTEN ELSEWHERE WILL NOT BE MARKED.**

INFORMATION FOR CANDIDATES

- The number of marks for each question is given in brackets [] at the end of each question or part question.
- 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 **External Power Supplies used with electronic products.**

FOR EXAMINER'S USE	
Q1	
Q2	
Q3	
Q4	
Q5	
TOTAL	

This document consists of **14** printed pages and **2** blank pages.

1 (a) Fig. 1 shows a selection of PCB spacers used for mounting printed circuit boards.

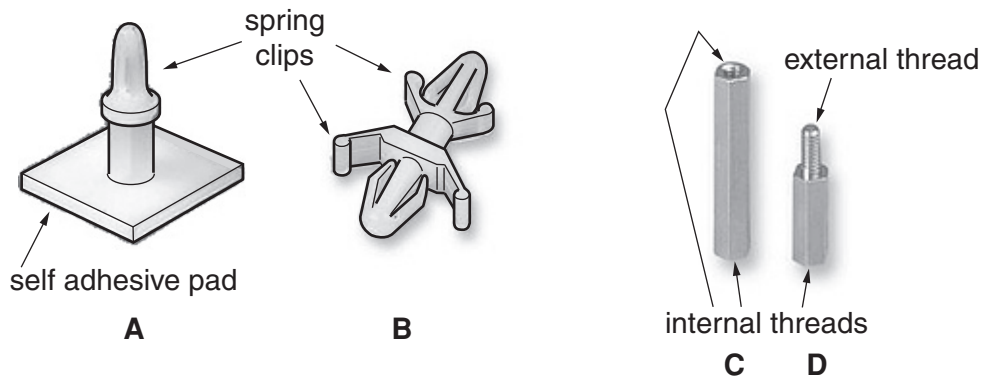


Fig. 1

(i) State the name of a suitable plastic for making spacer **A** and **B**.
[1]

(ii) State the name of a suitable metal for making spacers **C** and **D**.
[1]

(iii) State the process used to manufacturer spacer types **A** and **B**.
[1]

(iv) Give the reason that makes this process unsuitable for small scale manufacture.
[1]

(b) (i) State which of the spacers shown in Fig. 1 would be easiest to use when assembling a single prototype device.
[1]

(ii) Give the reason for your choice of spacer.

[1]

(c) Drilling accuracy is needed when using spacer types **B**, **C** and **D** to assemble printed circuit boards in cases.

(i) State **one** method that could be used to maintain drilling accuracy during batch production using only hand operated machinery.

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

(ii) During large scale production drilling is not always the most economical method for producing large numbers of holes.

Give **one** reason why drilling might be uneconomical.

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

(iii) Punching is an alternative method for producing accurate holes in sheet materials.

Give two advantages of using this method.

Advantage 1
.....[1]

Advantage 2
.....[1]

[Total: 10]

2 Fig. 2 shows two external power supplies used to power electronic products.

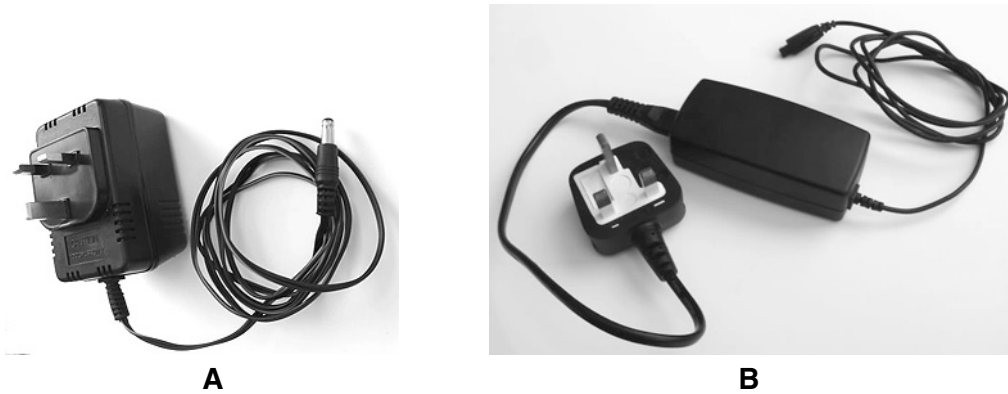


Fig. 2

(a) (i) Give **one** advantage of using external power supplies for electronic products.

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

(ii) State **one** reason why power supply **A** is safer to use than power supply **B**.

.....[1]

(b) The symbol in Fig. 3 is often found on the labels of power supplies.

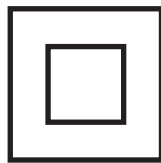


Fig. 3

(i) Give the meaning of the symbol shown in Fig. 3.

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

(ii) State **two** other pieces of information that you would expect to find on a power supply label.

1[1]

2[1]

(c) Some power supplies are regulated.

Explain the advantage of using a regulated power supply.

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

(d) Fig. 4 shows two types of transformer used in power supplies.

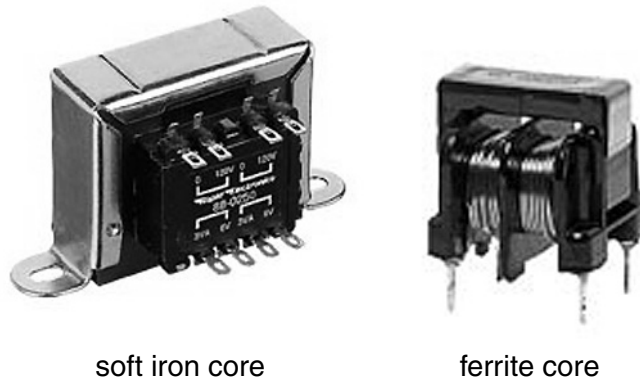


Fig. 4

(i) State the physical property that a transformer core must have.

.....[1]

(ii) State which type of transformer is suitable for use in a switched mode power supply.

.....[1]

(iii) Give the reason why this type of transformer is suitable for use in a switched mode power supply.

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

[Total: 10]

3 (a) Fig. 5 shows four types of capacitor.

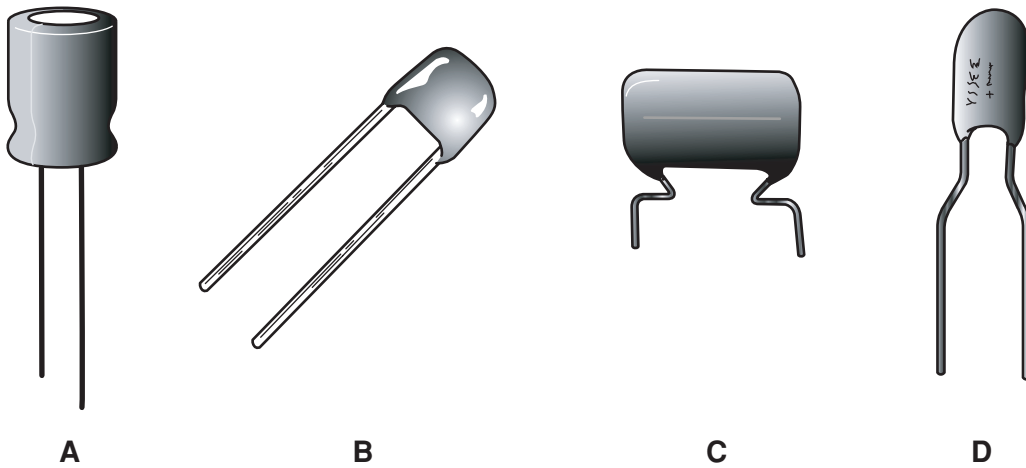


Fig. 5

(i) State the type of capacitor labelled **A**.

.....[1]

(ii) Give **one** disadvantage of capacitor type **A**.

.....[1]

(b) Fig. 6 shows a diagram illustrating the construction of a capacitor.

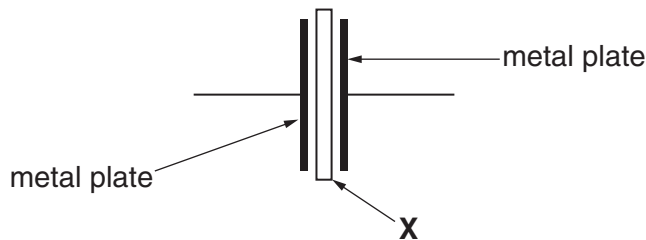


Fig. 6

(i) State the name of material **X** in Fig. 6.

.....[1]

(ii) As well as the capacitance value, the label on a capacitor gives a second piece of important information.
State the other piece of important information which should accompany all capacitor descriptions.

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

(c) Fig. 7 shows a simple circuit for charging and discharging a capacitor.

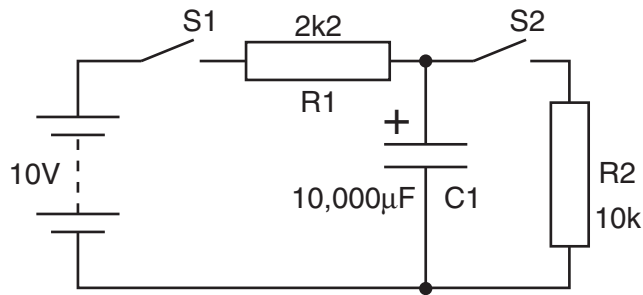


Fig. 7

(i) Calculate the time constant for the circuit when the switch S1 is closed.
Use the formula, $T = C \times R$.

.....

 [2]

(ii) Complete the graph in Fig. 8 to show the charge across the capacitor C1 when switch S1 is closed and switch S2 is open.

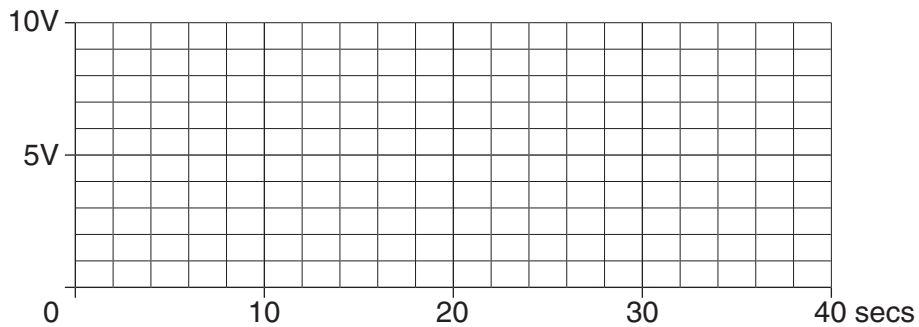


Fig. 8

[3]

(iii) Complete the graph in Fig. 9 to show the discharge across the capacitor C1 when switch S1 is opened and switch S2 is closed.

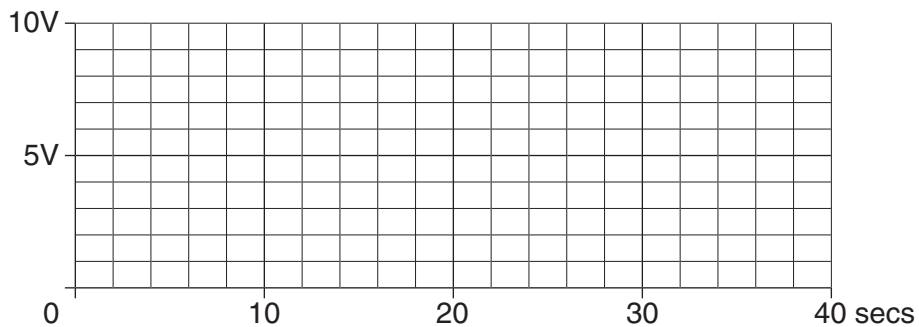


Fig. 9

[1]
 [Total: 10]

[Turn over

4 (a) Fig. 10 shows a circuit used to produce a stabilised 5V power supply.

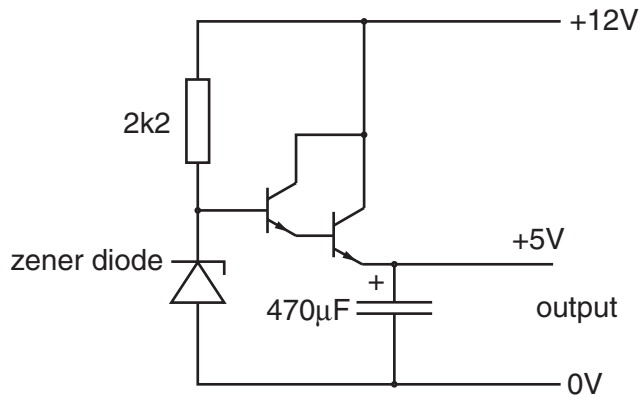


Fig. 10

The zener diode is reverse biased and does not conduct until a critical threshold voltage is reached.

It then conducts and maintains a rated voltage.

Zener diodes are available in a wide range of rated voltages.

(i) Explain the difference between a 'forward biased' and 'reverse biased' diode in a circuit.

.....

[2]

(ii) Zener diodes are available with the following voltage ratings.

- 5.0V
- 5.7V
- 6.1V
- 6.4V
- 7.2V

State the zener diode voltage needed to produce 5V at the output of the circuit shown in Fig. 10.

.....[1]

(iii) State the name of an alternative device which could be used to replace the circuit shown in Fig. 10.

.....[1]

(b) Fig. 11 shows an incorrect logic circuit.

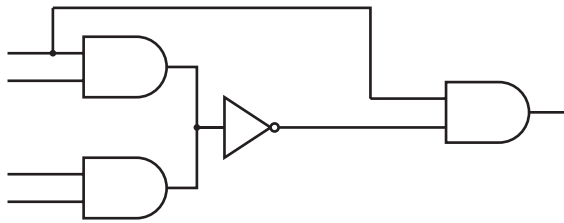


Fig. 11

(i) Describe the fault in the logic circuit.

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

(ii) Explain how the fault could affect the operation of the circuit.

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

(c) Logic gates are available as both TTL and CMOS types.

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

1.
.....[1]

2.
.....[1]

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

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

[Total: 10]

- 5 Fig. 12 shows a flow diagram for a dice program. The program is to be developed and downloaded to a PIC microcontroller.

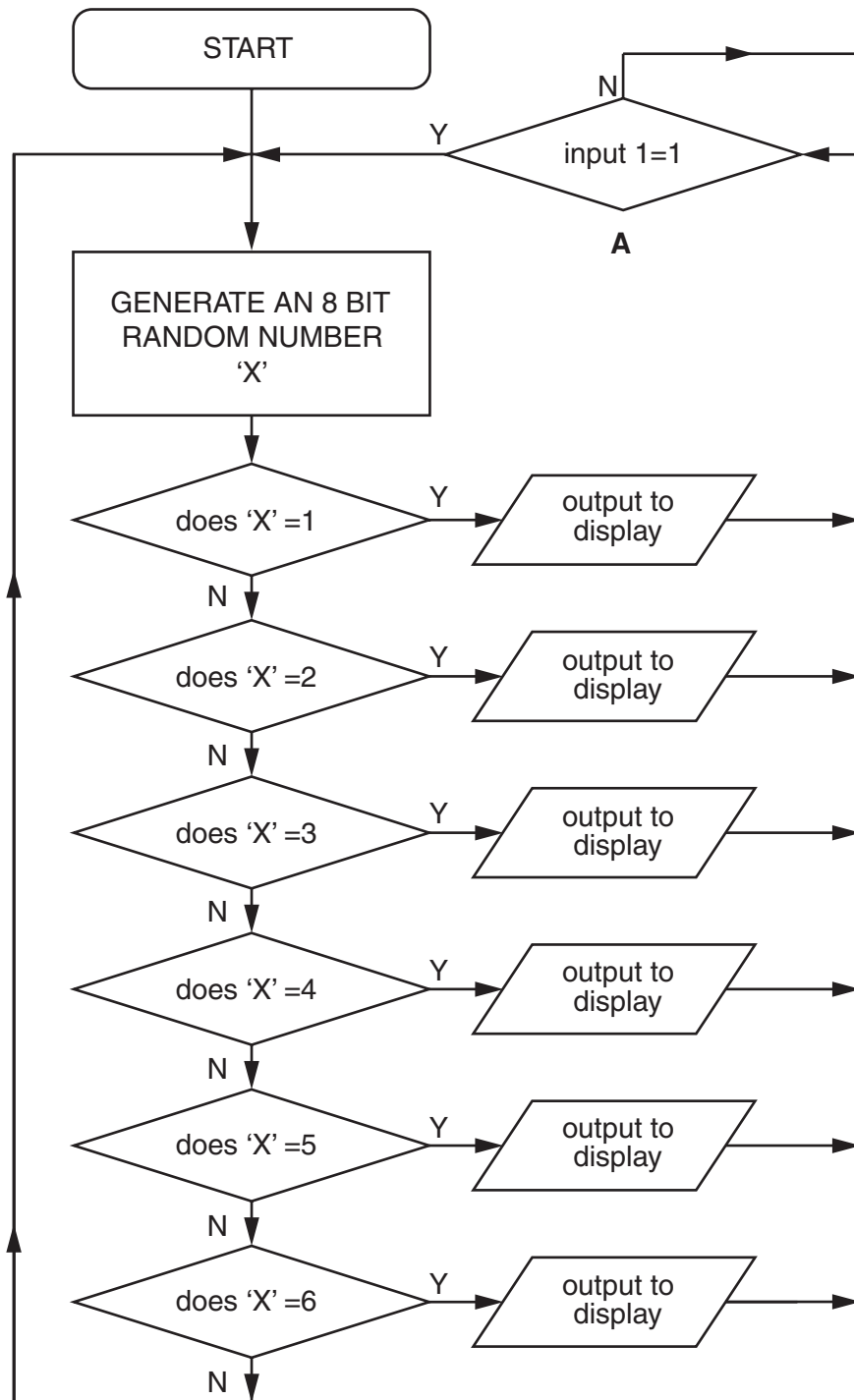


Fig. 12

(a) At one stage in the program a random binary 8 bit number is generated.

(i) State the highest decimal number that could be represented using an 8 bit binary code.
.....[1]

(ii) Explain why it is **not** important for numbers falling outside the 1 to 6 range to be generated.
.....
.....
.....
.....[2]

(iii) State the type of command represented by box **A**.
.....[1]

(iv) Once the program outputs a display in the range, it will continue to loop around command **A**, and display the output until instructed to continue and generate a new number.

Describe how two components could be connected to a PIC circuit to change an input logic level to activate command **A**.

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

13

The outputs of the PIC 16F627 can be turned to either high (1) or low (0) during the operation of a program.

- (i) Complete the table in Fig. 15 with the appropriate output pin states needed to display the number 6.

Output pin	7	6	5	4	3	2	1	0
Output state (0 or 1)								

Fig. 15

[2]

- (ii) Describe the changes that would be needed to the circuit if the PIC 16F627 was reprogrammed to *'sink' instead of 'source'* the LED display current.

.....

.....

.....

.....[2]

[Total: 10]

14
BLANK PAGE

15
BLANK PAGE

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

OCR is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.