Surname		Other Names	
Centre Number						Candidate Number				
Candidate Signature										

Leave blank

General Certificate of Secondary Education
June 2005

DESIGN AND TECHNOLOGY (ELECTRONIC PRODUCTS) (SHORT COURSE) Foundation Tier

3551/F

F

ASSESSMENT and QUALIFICATIONS ALLIANCE

Thursday 16 June 2005 1.30 pm to 3.00 pm

In addition to this paper you will require:
- blue or black pen, pencil, coloured pencils and ruler;
- an Insert Sheet (enclosed).

You may use a calculator.

Time allowed: 1 hour 30 minutes

For Examiner's Use	
Number	Mark
1	
2	
3	
4	
5	
TOTAL	
Examiner's initials	

Instructions
- Use blue or black ink or ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions in the spaces provided.
- Use the Insert Sheet included to help you answer Question 1.
- Do all rough work in this book. Cross through any work you do not want marked.

Information
- The maximum mark for this paper is 100.
- Mark allocations are shown in brackets.
- A list of formulae and other information is given on pages 2 and 3 which you may need to use when answering certain questions.
- Wherever calculations are needed you should show your working.
- You are reminded of the need for good English and clear presentation.

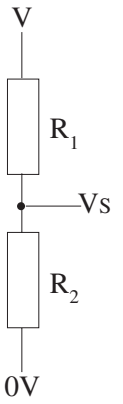
You may need to use one or more of the following formulae when answering questions which include calculations.

Potential Difference — Potential Difference = Current × Resistance — $(V = I \times R)$

Series Resistors — $R_{total} = R_1 + R_2 + R_3$ etc

Electrical Power — Electrical Power = Current × Potential Difference — $(P = I \times V)$

Potential Divider



$$Vs = \frac{R_2}{R_1 + R_2} \times V$$

where Vs = signal value
V = supply voltage
R_1 and R_2 are resistance values

Time Constant — Time Constant $\simeq$ Resistance × Capacitance — $(T \simeq R \times C)$

Astable Frequency for 555

$$f = \frac{1.44}{(R_1 + 2R_2) \times C}$$

Pulse duration

$$= \frac{1}{\text{frequency}}$$

You may need to use the following information when answering some of the questions.

Capacitor series 10, 22, 47

Resistor Colour Code

Colour	Band 1	Band 2	Band 3 (No. of 0s)	Band 4 (Tolerance)
Black	0	0	None	
Brown	1	1	0	
Red	2	2	00	
Orange	3	3	000	
Yellow	4	4	0000	
Green	5	5	00000	
Blue	6	6	000000	
Violet	7	7	–	
Grey	8	8	–	
White	9	9	–	
				Gold = 5%
				Silver = 10%

TURN OVER FOR THE FIRST QUESTION

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

1 **Figure 1** on the Insert Sheet shows eight different electronic components.

(a) Complete **Figure 2** below by both naming and drawing the electronic symbol for each component. Some parts have been completed as examples.

Component	Full Name	Symbol
A	.....	
B	.....	
C	.....	
D	*Electrolytic Capacitor*	
E	..... *Switch*	
F	.....	
G	*Fuse*	
H	.....	

Figure 2

(10 marks)

(b) Name a component that is described by each statement below.

(i) It has a resistance that changes as temperature changes.

.....

(1 mark)

(ii) It is used to limit the amount of current flow.

.....

(1 mark)

(iii) It will store a small charge of electricity.

.....

(1 mark)

(iv) It has three leads called anode, cathode and gate.

.....

(1 mark)

(c) Calculate the total resistance of the combination shown in **Figure 3**.

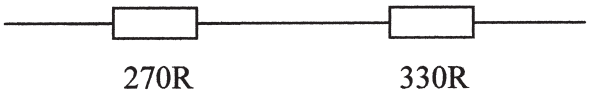


Figure 3

Formula .....

Working

Answer with units .....

(3 marks)

(d) Complete **Figure 4** to show the colour code of a 680R resistor with a +/–5% tolerance.

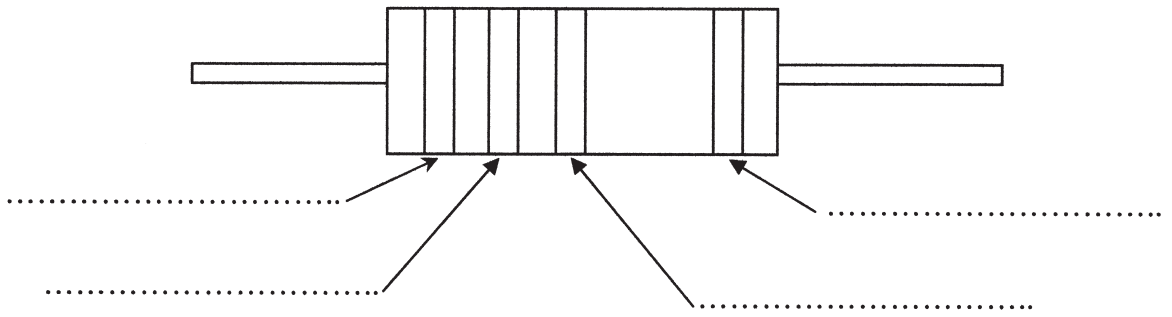


Figure 4

(4 marks)

21

2 You have been asked to design an electronic dice to be used by children when playing games.

Analysis

(a) List **two** things that you should think about when designing the electronic dice. An example has been given.

The likely cost of the whole project including both components and materials.

1 .....

2 .....

(4 marks)

Research

The layout of a research plan for the electronic dice is shown in **Figure 5**.

(b) Complete **Figure 5** by adding suitable research sources and stating the information that you would hope to find. *(7 marks)*

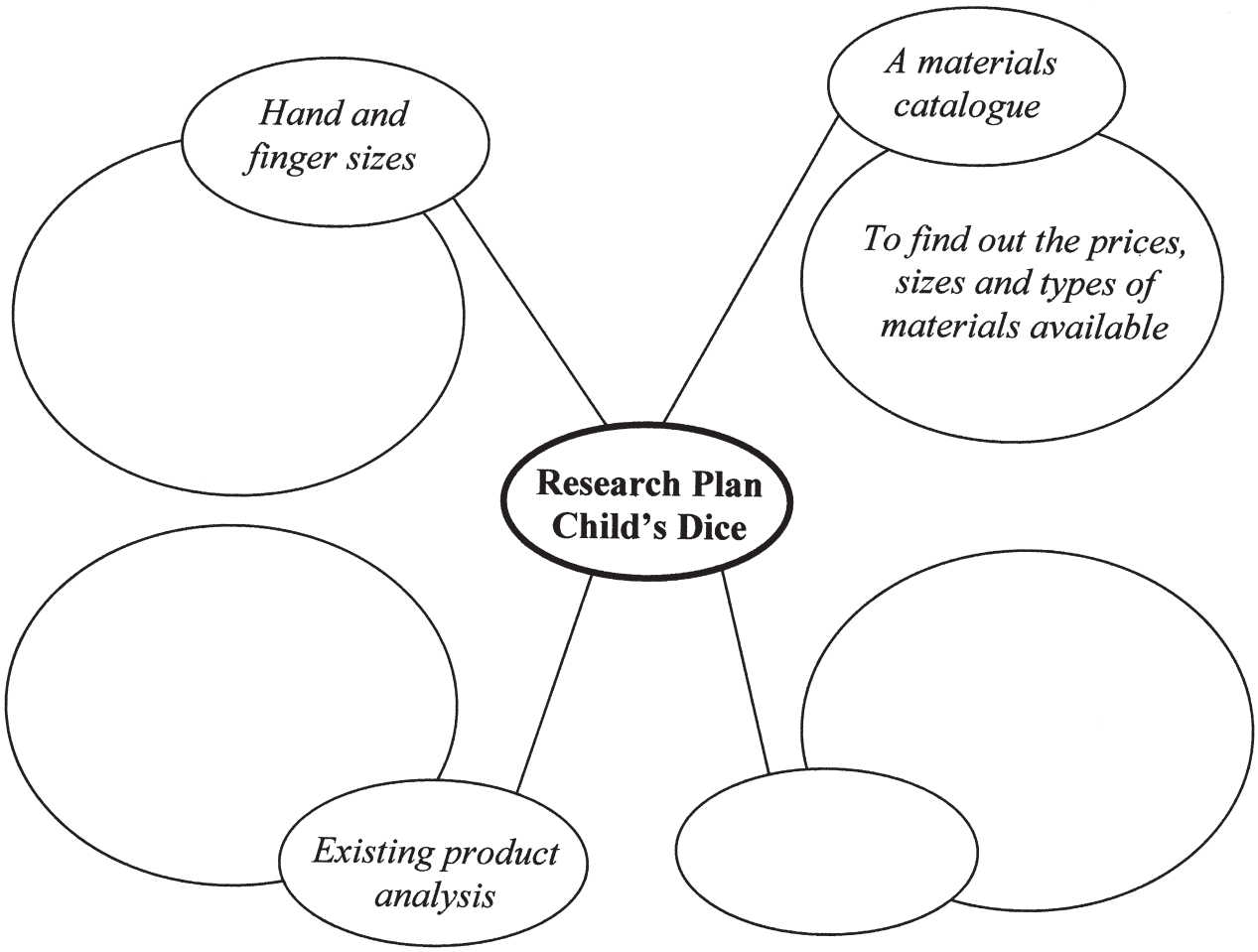


Figure 5

(c) Describe how the information from the analysis and research may affect the final design.

.....

.....

.....

.....

(2 marks)

(d) Give **four** specification points for the electronic dice. **Two** of the points should be about the casing and **two** about the electronics. Examples have been given.

(i) Casing specifications

Not too heavy – so that it can be used by young children.

1 .....

2 .....

(4 marks)

(ii) Electronic specifications

The numbers will be made up from arrangements of 5 mm LEDs.

1 .....

2 .....

(4 marks)

21

TURN OVER FOR THE NEXT QUESTION

3 This question is about designing, making and evaluating the electronic dice.

(a) (i) Use notes and sketches to show:

- a design for the casing of the dice; *(4 marks)*
- how the dice is switched on and activated. *(2 marks)*

Quality of communication *(2 marks)*

(ii) Give the name of a suitable material from which the casing could be made.

Material .....

(1 mark)

(iii) Use notes and sketches to show:

- a suitable method of fitting an LED into the case; *(2 marks)*
- how the circuit is securely held in place in the casing. *(3 marks)*

(b) List **two** situations where health and safety hazards might be an issue whilst making the casing and give the precaution that you would need to take.

Situation 1 .....

Precaution .....

.....

Situation 2 .....

Precaution .....

.....

(4 marks)

(c) Explain **two** methods of evaluating the finished dice.

1 .....

.....

2 .....

.....

(4 marks)

(d) Give **two** reasons why quality checks need to be made during the making of electronic products.

1 .....

.....

2 .....

.....

(4 marks)

26

TURN OVER FOR THE NEXT QUESTION

4 **Figure 6** shows a block diagram of a fire alarm.

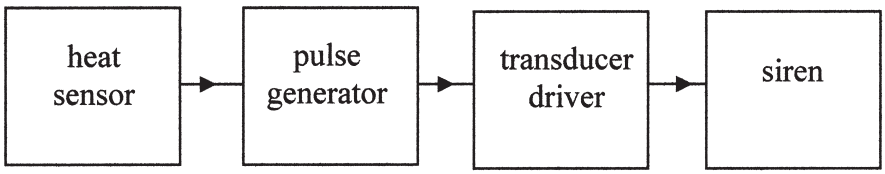


Figure 6

(a) State which block represents

(i) the final output stage .....
(1 mark)

(ii) an input stage .....
(1 mark)

(iii) an astable. .....
(1 mark)

(b) State the block in which you would find

(i) a transistor .....
(1 mark)

(ii) a thermistor .....
(1 mark)

(iii) the control of the frequency of the sound. .....
(1 mark)

(c) **Figure 7** shows a pulse generator circuit used as part of the system.

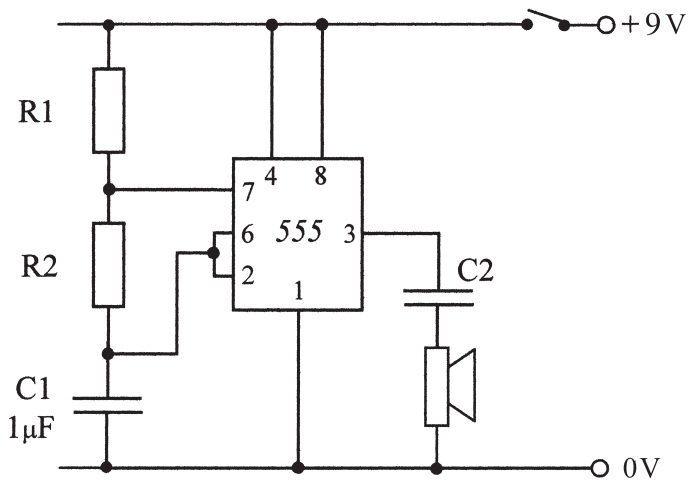


Figure 7

Component **C1** helps to control the frequency of the circuit.

(i) Circle the **two** components, other than **C1**, in **Figure 7** that control the frequency of the circuit. *(2 marks)*

(ii) Explain the effect on the sound from the loudspeaker if the value of **C1** was increased.

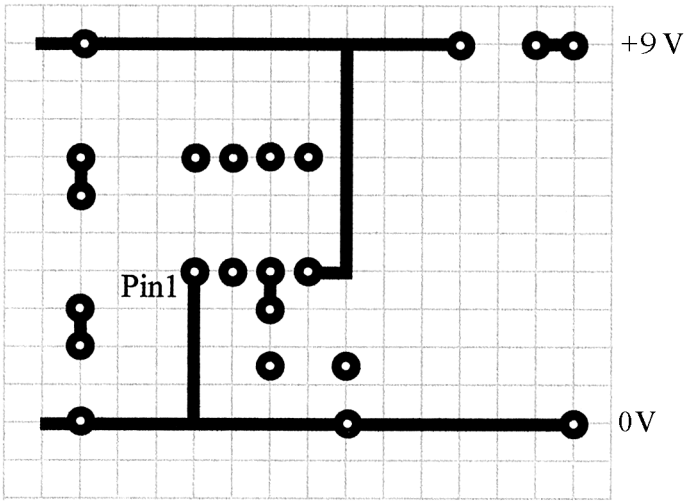
.....

.....

(2 marks)

(d) **Figure 8** shows the incomplete PCB design of the **pulse generator** stage of the circuit.

The pulse generator circuit is shown in **Figure 7**.



Viewed from the component side

Figure 8

Complete **Figure 8** by adding **five tracks** to the PCB so that:

- pin 8 is joined to the +V rail;
- pin 7 is joined between R1 and R2;
- pin 6 is joined to pin 2;
- pins 6 and 2 are joined between R2 and C1;
- C2 is joined to the loudspeaker.

(5 marks)

Quality of drawing *(2 marks)*

17

5 Shown below are areas of electronic design where ICT could be used.

(a) Choose **three** areas from the list, stating when each could be used and explaining **one** advantage for each choice.

An example has been given.

Circuit simulation **PCB design** **Case design** **CAM**

Example Spreadsheets

When used Calculating the cost of the components

Advantage As I changed the circuit design the total price of the components automatically changed so I could keep control over my spending

1 .....

When used .....

(1 mark)

Advantage .....

.....

(2 marks)

2 .....

When used .....

(1 mark)

Advantage .....

.....

(2 marks)

3 .....

When used .....

(1 mark)

Advantage .....

.....

(2 marks)

(b) During the past twenty years the use of ICT and electronic control systems have revolutionised manufacturing.

Explain **one** advantage and **one** disadvantage that these developments have had for the environment.

Advantage .....

.....

.....

(3 marks)

Disadvantage .....

.....

.....

(3 marks)

15

END OF QUESTIONS

THERE ARE NO QUESTIONS PRINTED ON THIS PAGE

THERE ARE NO QUESTIONS PRINTED ON THIS PAGE

THERE ARE NO QUESTIONS PRINTED ON THIS PAGE

General Certificate of Secondary Education
June 2005

DESIGN AND TECHNOLOGY: ELECTRONIC PRODUCTS FULL AND SHORT COURSE

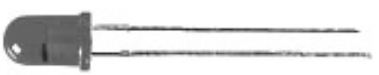
3541F/3551F

F

ASSESSMENT and QUALIFICATIONS ALLIANCE

The photographs on this sheet are for use in answering:

Foundation Tier: Question 1



A

B

C

D

E

F

G

H

Figure 1

Images A–G reproduced with kind permission of *Rapid Electronics Ltd*.

Insert to 3541/F and 3551/F