ASSESSMENT and QUALIFICATIONS ALLIANCE

Mark scheme June 2003

GCSE

Design and Technology Electronic Products

3541 (Full Course)

Higher

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Design and Technology: Electronic Products

Full Course: Higher Tier

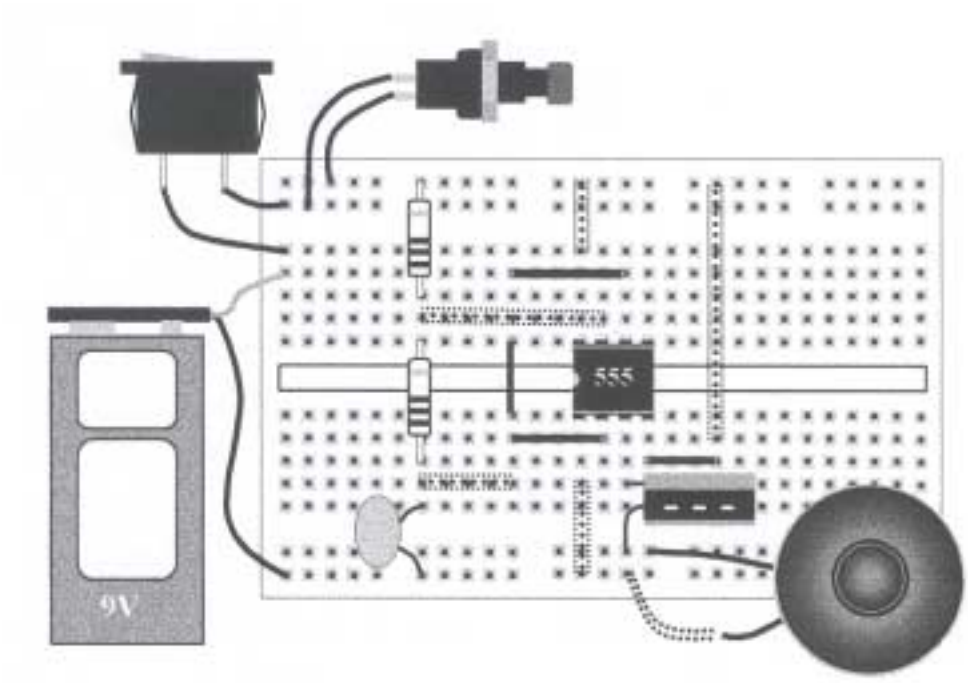
Question 1

(a)	(i)	18000	(1 mark)
		18kΩ	(1 mark)
	(ii)	Tolerance can be +/- %	(1 mark)
		all resistors not exact value not just 5%	(1 mark)
(b)	(i)	Top end of resistor joined	(1 mark)
		Bottom end joined	(1 mark)
		Only one minus if joined in same hole	
	(ii)	Components can be changed easily etc	(1 mark)
		Components can be used again etc any suitable response	(1 mark)
	(iii)	$\frac{1}{R} = \frac{1}{R1} + \frac{1}{R2}$ or other suitable	(1 mark)
		$\frac{1}{R} = \frac{1}{12} + \frac{1}{6}$ or suitable	(1 mark)
		Calculation to arrive at 4	(1 mark)
		Correct with units 4kΩ or 4K	(1 mark)
(c)	(i)	There are only a set number of resistors to cover all	(1 mark)
		Certain published values, limited range etc any 1	(2 marks)
	(ii)	3.9K (if resistor does not need to protect components) if included	(2 marks)
		4.3K (2 marks)	
		4.7K (1 mark)	
		3.9K (1 mark)	
		CE (1 mark)	(2 marks)

Total 16 marks

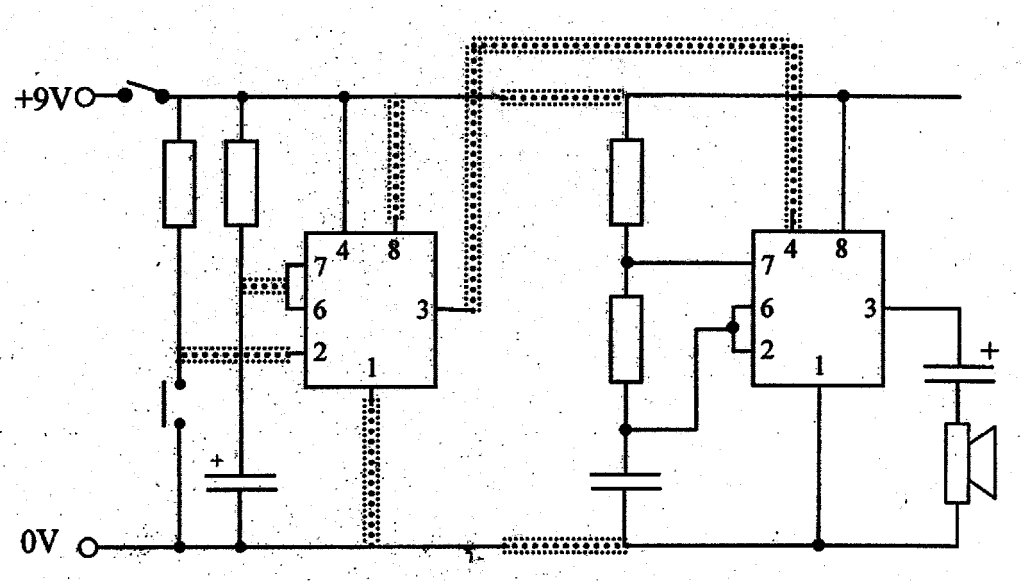
Question 2

(a)	astable	(1 mark)
(b)	R1 and R2	(1 mark)
	2/3	(1 mark)
	low-goes, down, logic '0', 0V	(1 mark)
	recharge/charge	(1 mark)
(c)	Formula 1.44/(R1 +2R2) x C	(1 mark)
	Working reference to R1 + 2R2 =37K	(1 mark)
	Ref to µ ie divide by 1,000,000 or change to MΩ	(1 mark)
	Correct working –	(1 mark)
	Correct answer 389Hz	(1 mark)
(d)	Pin 1 to 0V	(1 mark)
	Loud speaker to 0V	(1 mark)
	Pin 4 to +V	(1 mark)
	Pin 8 to +V	(1 mark)
	Pin 7 to PD	(1 mark)
	Pin 2 to Cap/Res	(1 mark)
	Only minus 1if joined into same hole	



(e) (i) Mono - Pin 8 to +V (1 mark)
Pin 1 to 0V (1 mark)
Pin 2 to sw/res junction (1 mark)
Pins 6/7 to Res/cap junction (1 mark)

(ii) **Mono to astable – Pin 3 to pin 4** (2 marks)
0V rail to 0V (1 mark)
9v to 9v (1 mark)
OR
Pin 3 to +V rail (1 mark)
0V rail to 0V (1 mark)
Pin 4 to +V (1 mark)



Quality of drawing - Straight lines (1 mark)
Junction dots at least one. (1 mark)

(f) Can be programmed and re programmed
Can be programmed to perform varied tasks
Can be tested and modified before use, set exactly
Can replace a complicated circuit etc.
any other suitable response
Smaller, less big circuit
Any other suitable response with qualification as necessary e.g. cheaper, smaller. (2 marks)

(g)

C	one correct	(1 mark)
D	two correct	(2 marks)
A	three correct	(2 marks)
B	All correct	(3 marks)

Total 31 marks

Question 3

(a) No damage to components,
Simulation possible, link to CAD - any other suitable response
values quickly changed
Possible greater range of components available.
High outlay but low future running costs. (3 marks)

(b) Red to +9V (1 mark)
Red/Black to 0V } Only. (1 mark)
Black to –9V (1 mark)

(c) (i) Additional resistor or one VR to form PD (1 mark)
Value of second resistor 10K (1 mark)

(ii) PD with LDR/ Correct symbol (1 mark)

(iii) Equation, $VS = \frac{R2}{R2 + R1} \times 9$ (1 mark)

Working $VS = \frac{500}{500+400} \times 9$ (1 mark)

Answer 5V (1 mark)

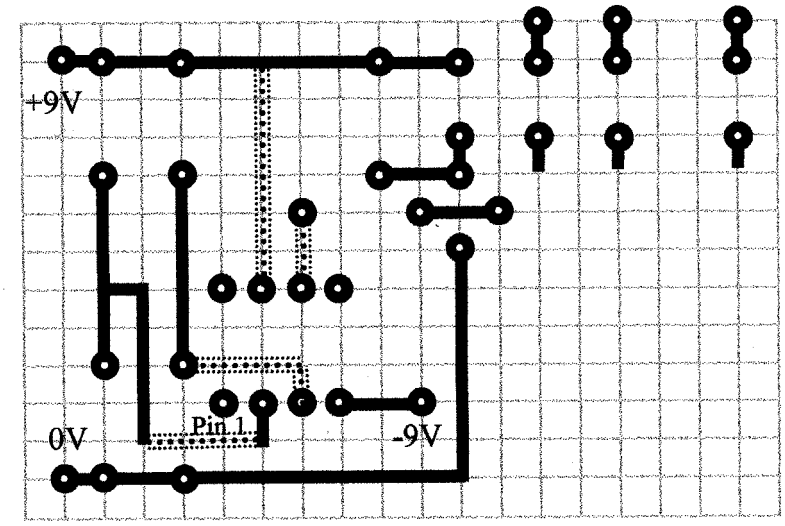
(d) (i) Reference to pin 2 (1 mark)
Sensor to pin 3 (1 mark)

(ii) Bottom N/o switch connection to 0V (1 mark)
Connection from collector to common relay (1 mark)
Both correct (1 mark)

(e) Set voltage on one input (1 mark)
Variable voltage at other input (1 mark)
Voltage change as light changes (1 mark)
Voltage change at output (1 mark)
Switches transistor and relay activated or lights on (1 mark)

(f) All component distances correct,
pad and tracks with variable sizes etc
All changeable, quickly
Connect directly to other CAD to CAM etc
Accurate-
(quick/cheap needs quantification) Any 3 (3 marks)

(g) Pin 2 lead joined to other PD (1 mark)
Pin 3 to potential divider (1 mark)
Pin 7 to + rail } Only (1 mark)
Pin 6 to resistor (1 mark)



(viewed from component side)

Total 29 marks

Question 4

(a) Basic answer – safe (any answer 1 x 3)
Qualified answer
No sharp edges to catch on skin
Non toxic paint/finish so as not to cause problem if chewed
Material that will not splinter etc 3 x 2 (6 marks)

(b)

Information that I need	Where I might find the information
How children learn number Style of presentation, layout of sums Degree of difficulty of sums, type of sums Any educational development, issues – numeracy	*Nursery of Primary schools*
Type, size and variety of materials available, costs and availability, delivery costs.	*Local Suppliers materials catalogue*
A range of toys already on the market	Toy catalogues, magazines, visit toy shop and ask shop assistant.
The smallest sizes that can be safely used so as not to risk a child choking if they were to place it in their mouths.	Local trading standards, BSI publications. Regulatory Not doc/nurse
Range of sizes for the age group to use the toy. Hand sizes, what can be gripped easily Ergonomic needs	*Anthropometric Data*

(5 marks)

(c) (i) HIPS, polystyrene sheet, ABS, PVCS or other suitable material (1 mark)
basic reasoning (1 mark)
Detailed reasoning (1 mark)
(2 marks)

(ii) Suitable shape for construction for material chosen

E.g. Vac Form, rounded corners/draft angle or details of any jointing. (2 marks)

A recognised construction method but not fully suited to material stated in (i) (1 mark)

Detailed provision of the housing for the blocks suitable for the material stated. (2 marks)

Reference to provision of the housing for the blocks (1 mark)

Any other details – sizes, fitting of base, finish, colours etc (1 mark)

Clear 3D drawing (2 marks)
Drawing that can be interpreted (1 mark)

(iii) Circuit fixed neatly in place use annotation (2 marks)
Circuit held in place (1 mark)
Clear 3D/side/plan/ technical drawing (2 marks)
Understood but lacking in quality/detail (1 mark)

(d) (i) Reed Switch, Push to make, basic contacts (1 mark)
Pressure Pad, LDR etc. (1 mark)
Micro switch
Any suitable sensors. (2 marks)

(ii) Detailed sectional view or fully annotated explanation
Some evidence of knowledge and annotated detail (1 mark) (2 marks)

(e) 3 remaining switches to inputs (3 marks)
2 remaining outputs to inputs (2 marks)
Final output to buzzer (1 mark)
4 LED's and buzzer on when completed. (1 mark)

e.g.

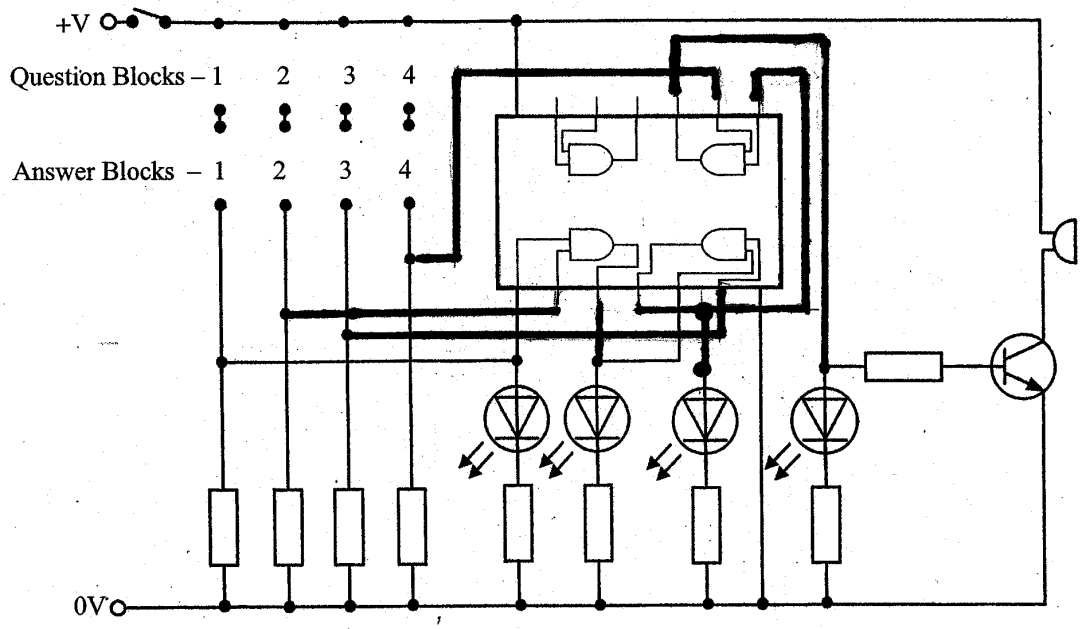


Figure 15

Total 36 marks

Question 5

(a) (i) Greater profit margins, long production runs, less staff required, built in QC, etc any 2 (2 marks)

(ii) Wider range, competition so better prices etc cheaper products, quality products (2 marks)

(iii) Less work social issues for area

OR argue competitive with other markets and providing skilled work and increase in service industry. (2 marks)

(b) Use of energy, sustainable use, pollution, waste deposits Removal of minerals/forests can leave top soil very vulnerable to errosion. (1 mark)

Workers conditions, waste disposal, air, noise pollution
Pollution of atmosphere, use of energy (2 marks)
Energy when being used, pollutants emitted during use
Air, noise pollution, (2 marks)
Lack of landfill, pollution of earth, atmosphere,
Public health, difficulty in disposal (2 marks)

Total 13 marks

Total for paper 125 marks