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Mark Scheme (Results)
Summer 2010

GCSE

GCSE Design and Technology: Systems and Control (1974)
Paper 2F
Foundation Written Paper.

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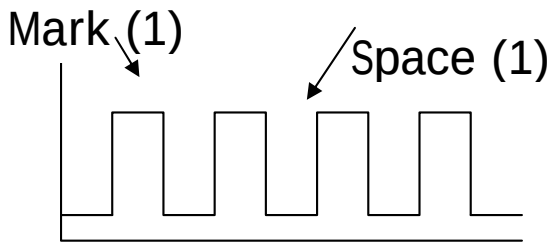
Publications Code.

General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

<table>
<tr><td>Question Number</td><td>Answer</td><td>Mark</td></tr>
<tr><td>1(a)
(i) & (ii)</td><td>Award one mark for each correct response in the correct box.
<table>
<tr><td>Key Switch</td><td>Switching on and off, Restricting access.</td></tr>
<tr><td>Resistor</td><td>Limiting current, restricting the flow of electricity.</td></tr>
<tr><td>Battery, PP3
[do not accept cell]</td><td>Powering a circuit, providing energy/voltage/power</td></tr>
<tr><td>Breadboard, proto-board, prototyping board</td><td>Modelling/trialling/testing/prototyping circuits.</td></tr>
<tr><td>Etch tank, etching tank</td><td>Making PCBs, etching circuits.</td></tr>
</table>
(10x1)</td><td>(10)</td></tr>
<tr><td>Question Number</td><td>Answer</td><td>Mark</td></tr>
<tr><td>1(b) (i)</td><td>1 / one
(1X1)</td><td rowspan="3">(3)</td></tr>
<tr><td>(ii)</td><td>7 / seven
(1X1)</td></tr>
<tr><td>(iii)</td><td>5.0 V
(1X1)</td></tr>
<tr><td>Question Number</td><td>Answer</td><td>Mark</td></tr>
<tr><td>1(c)</td><td> 

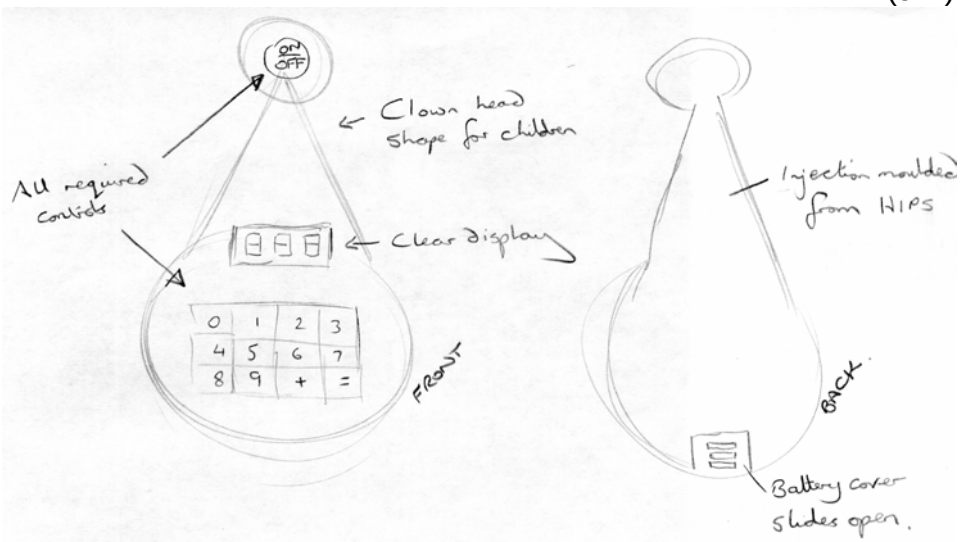
(2X1)</td><td>(2)</td></tr>
<tr><td>Question Number</td><td>Answer</td><td>Mark</td></tr>
<tr><td>1 (d)</td><td>Any one from:
• timesaving
• because lots are needed
• to minimise wastage
• to use the PCB efficiently
(1X1)</td><td>(1)</td></tr>
</table>

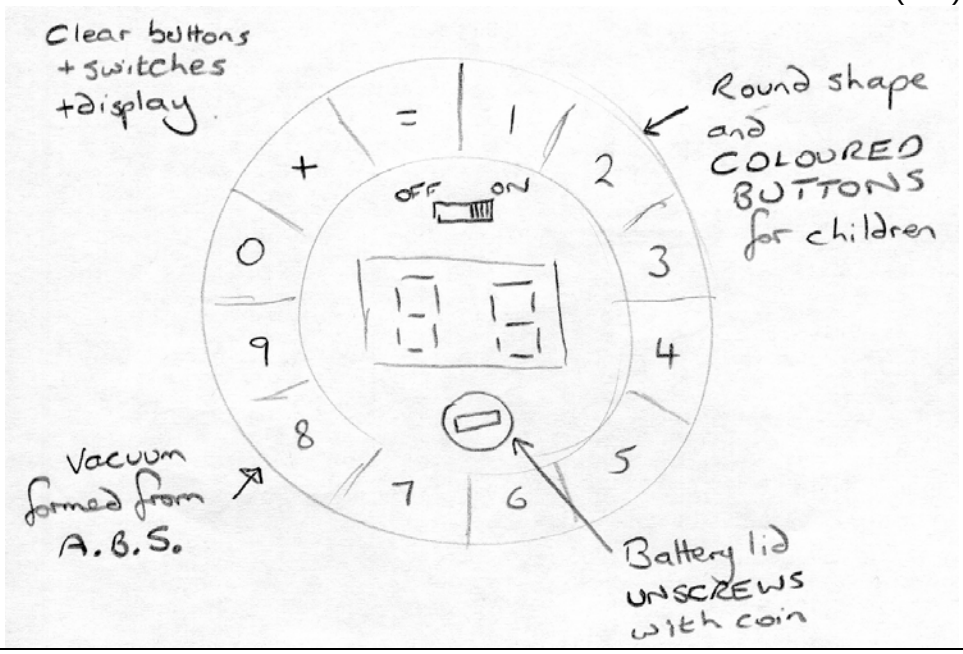
Question Number	Answer	Mark
1 (e)	Any **two** from: • Timesaving (1) because mistakes are easy to edit (1) • Can export designs (1) using ICT/e-mail (1) • Using computer editing (1) it is easy to make changes (1) • Easy to store(save)(1)/retrieve/amend (1) • can last (1) using simulation software (1) **Points must be linked, not 4 statements, can mix and match if linked** (2X1) (2X1)	**(4)**
Question Number	Answer	Mark
(f)	**One** task described: • by robots/pick and place machine/production lines/automatic machinery (1) which pick up components/place them on the board(1) not machines (2X1)	**(2)**
	Total for Question 1	**22 marks**

Question Number	Answer	Mark
2(a)	**One** component named: • LCD (1) • LED display (1) • 7/8/14/16 segment display (1) • dot matrix (1) • Nixie tube (1) (1x1)	**(1)**
(b) (i)	Any **one** explained: • Batteries can be small (1) therefore keeping product small (1) • Batteries can be light/no external power source required (1) therefore keeps product portable (1) Mix and match if sensible (2x1)	**(2)**
(b) (ii)	Any **two** from: • NiCad (1) • Alkaline (1) • Lithium Ion (1) • zinc carbon (1) • zinc chloride (1) • nickel hydride (1) • silver oxide (1) • watch battery/button cell (1) • rechargable (1) (2X1)	**(2)**
Question Number	Answer	Mark
2(c)	Explain **two** reasons: • easily formed/worked (1) using only school equipment (1) • recyclable (1) so environmentally friendly (1) • tough/high impact strength(1) so it protects the circuit (1) • rigid (1) so it keeps its shape once formed (1) • Available in many colours (1) so it will be attractive (1) 2 linked points, not 4 statements (2X1) (2X1)	**(4)**

Question Number	Answer	Mark
2(d)	Any **two** from: • IC can be removed/used elsewhere (1) • IC can be replaced/swapped/inserted the other way round (1) • no soldering required/assembly easier (1) • IC doesn't get hot/damaged during soldering (1) (2X1)	**(2)**
Question Number	Answer	Mark
2(e)	• fewer components needed (1) • less space required (1) • can be reprogrammed (1) • a custom made IC is not required. (1) (2X1)	**(2)**
Question Number	Answer	Mark
2(f) (i)	• Resistance/ohms/continuity/Ω (1) (1X1)	**(1)**
(ii)	• If electricity/current can/can't flow(1) • If there is a break in a track (1) • A short circuit (1) (1X1)	**(1)**
(iii)	CAN – Low CAN – High BREAK – Low BREAK - High Mark in conjunction with 2fii (1X1)	**(1)**

Question Number	Answer	Mark
2(g)	• Can buy in bulk (1) giving greater profits(1) • Greater sales(1) so can recoup investment costs faster(1) • Increased production (1) enables greater investment in production equipment(1) • Many circuits made on one board saving time/money/waste ,ix and match if linked (2X1) (2X1)	**(4)**
Question Number	Answer	Mark
2(h)	• No separation/sorting is required (1) enabling easier recycling (1) • Non-mixed scrap is worth more than mixed scrap(1) making recycling economically viable(1) • No fixing/adhesives required (1) therefore less material would be used (1) (2X1)	**(2)**
	Total for Question 2	**22 marks**

Question Number	Answer	Mark
3(a)	**Design Idea 1** Each point of the specification has two marking points. 1 mark should be awarded for evidence of each point of specification resolved in the design. For each specification point with both elements visually satisfied **2 marks** For each specification point with only one element visually satisfied **1 mark** Where an answer does not viably answer a specification point **0 marks** Candidates may answer any specification point in either graphical form or by annotation. **No marks are awarded for quality of communication.** **Specification point 1** **Appeal to young children and be easy to switch on and off** • any creative design idea that will appeal to young children/use of bright colours/interesting shapes/television or cartoon characters(1) • Indication of a **specific** type of switch which will be easy to operate. **Specification point 2** **Have the following easy to use controls; 0 to 9, +, =** • number/function controls will be present • there will be indication of their ease of use **Specification point 3** **Have easy access to the batteries** • evidence that the batteries can be accessed • evidence that access is easy **Specification point 4** **Be made from materials and processes suitable for batch production** • Evidence that material is suitable for batch production Evidence that material is suitable for batch production (8X1)  	**(8)**

3(a) cont	**Design Idea 2** To score a mark for Design Idea 2, each specification point must be resolved**, but the second design idea must be technically /conceptually different in design and construction from the first** and not a simple variation on a theme to be awarded the mark. Use exactly the same criteria as design idea 1 to mark design idea 2. • a different way of appealing to young children (1) • a different On/Off control (1) • different number/function controls (1) • a different means of operating these controls (1) • different battery access mechanism (1) • evidence that access is easy (1) • a different material (1) • a different process (1) (8X1) 	**(8)**

Question Number	Answer	Mark
3(b)	Each point clearly evaluated. If a candidate has indicated design idea 1 and then evaluates design idea 2 for all or part of (i), (ii) & (iii), then the idea in greater evidence should be marked. The evaluation of the design must contain reference to either positive or negative aspects, not just simply a description of the design. Award 1 mark for a correct evaluation/justification relating to each design feature and how it succeeds or fails. Repetition of original specification scores 0.	
3(b) (i)	Evaluation of: **Appeal to young children and be easy to switch on and off** Positive or negative reasons relating to: • its appeal for children • a simple on/off control e.g. *Children will like the clown's hat design, and they can easily press the ball to switch it on and off.* (2x1)	**(2)**
3(b) (ii)	Evaluation of: **Have the following easy to use controls; 0 - 9, +, =** Positive or negative reasons relating to: • 0 – 9, + & = functions • Their ease of use e.g. I've included *all numbers and +/= buttons, but they're all mixed up so they're difficult to use.* (2x1)	**(2)**
3(b) (iii)	Evaluation of: **Have easy access to the batteries.** Positive or negative reasons relating to: • access to the batteries • how easy that access is e.g. *The battery can be changed, but the screw means it's not very easy.* (2x1)	**(2)**
	Total for Question 3	**22 marks**

Question Number	Answer	Mark
4(a)	For each point, give **one** reason why it should be included.	
4(a)(i)	**Quality** **Point:** It must be reliable/accurate/durable/robust/look/feel good (1) **Reason:** So customers will purchase/tell friends/won't complain/don't break (1) (2x1)	**(2)**
4(a)(ii)	**Environment** **Point:** There must be minimal wrapping/no harmful chemicals in the batteries/recyclable/solar cells/rechargeable batteries/'environmental' materials/minimal manufacturing waste (1) **Reason:** Will create less environmental/waste damage/less landfill tax/green credentials lead to increased sales(1) (2x1)	**(2)**
4(a)(iii)	**Safety** **Point:** No sharp edges/toxic paints/removable or swallowable parts(1) **Reason:** Will avoid injury to users/children/other household members(1) (2x1)	**(2)**
Question Number	Answer	Mark
4(b)	Any **two** from: • Can be read in the dark • easily viewed • digits are clear • universally understood • easy to integrate with circuit • can switch between different functions • Low power consumption (2X1)	**(2)**

Question Number	Answer	Mark
4(c)	Any **two** from: • rapid process • suitable for volume (mass) production, • little finishing required • products are identical/accurate • small workforce required • complex shapes possible • low-cost process once setup costs are recouped • low/recyclable waste (2X1)	**(2)**
Question Number	Answer	Mark
4(d)	Any **one** from: • easy to apply (1) so manufacturing is easier (1) • strong/permanent fixing method(1) so timer won't come apart(1) • dries quickly(1) making manufacturing faster(1) • doesn't need to be clamped(1) so manufacture is easier(1) • appropriate adhesive (1) for this material (1) • no screws (1) so fewer parts (1) mix and match if linked (2X1)	**(2)**

Question Number	Answer	Mark
4(e)	Any **two** from: • easily formed(1) so makes manufacturing easier(1) • good conductivity/low resistance(1) so electricity flows easily(1) • hardwearing(1) so won't wear quickly(1) • doesn't rust/oxidise(1) so will last for a long time(1) mix and match if linked (2X1) (2X1)	**(4)**
Question Number	Answer	Mark
4(f)	Any **one** of; • so they don't sell faulty batteries(1) which would lose customers(1) • to make sure production line is working effectively(1) so all batteries produced work properly(1) • if there are any problems(1) they will be fixed rapidly(1) • so they know what the batteries performance is(1) so they can tell their customers(1) • not enough time/manpower to check every one (1) so they are checked at intervals (1). (2x1)	**(2)**

Question Number	Answer	Mark
4(g) (i)	Any **two** from: • There are control buttons/switches(1) which are easy to read/operate/clearly labelled (1) • Well spaced (1) to avoid pressing wrong ones (1) (2X1)	**(2)**
4(g) (ii)	• the display is large(1) so it will be easy to read(1) • the display is digital (1) which is very clear (1) mix and match if linked (2X1)	**(2)**
	Total Marks	**22**
	Total for paper	**88**

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Order Code Summer 2010

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