ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Secondary Education
June 2011

Design and Technology
Systems and Control Technology
45651

Unit 1: Written Paper

FINAL

Mark Scheme

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

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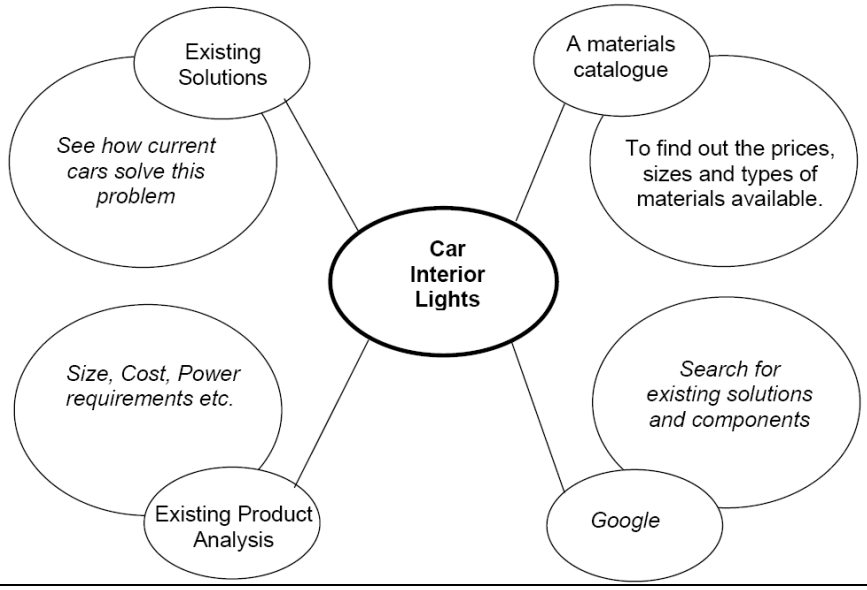
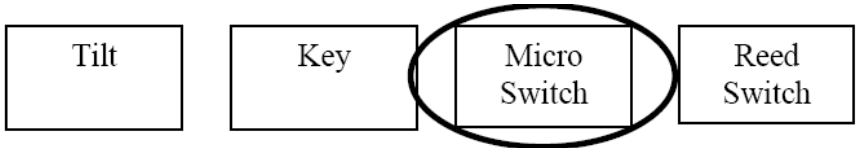
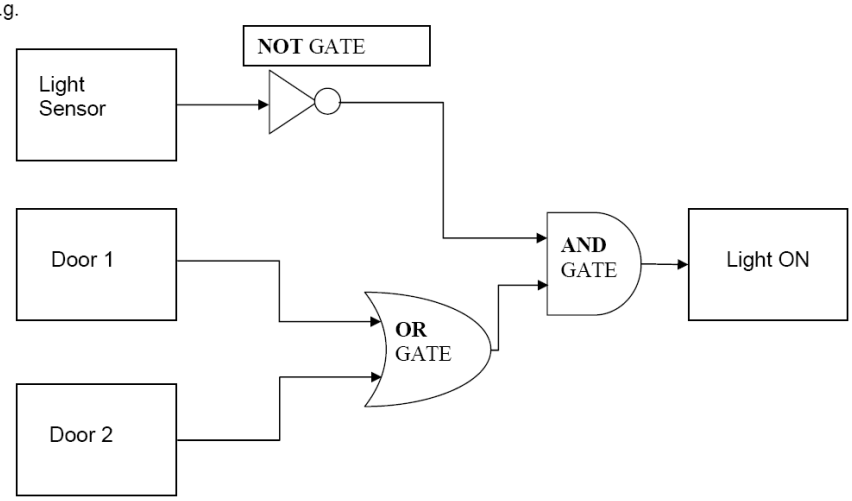
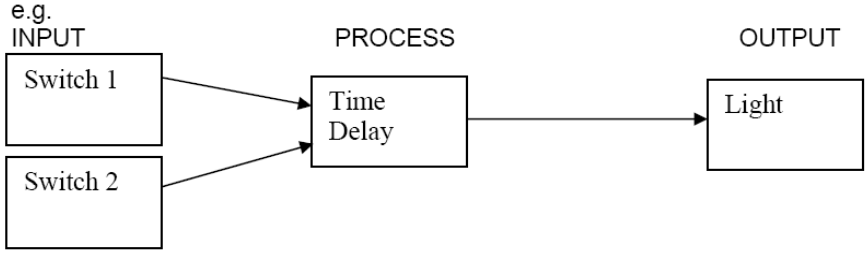
COMPONENT NUMBER: 45651

COMPONENT NAME:
New Specification - GCSE Design and Technology (System and Control Technology)

FOR EXAMINERS – PLEASE NOTE THAT IF YOU ARE UNSURE HOW TO AWARD A RESPONSE FROM A CANDIDATE, PLEASE SEEK CLARIFICATION OR ADVICE FROM YOUR TEAM LEADER OR THE PRINCIPAL EXAMINER.

Section A

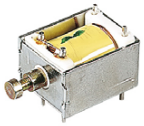
Question	Part	Sub Part	Marking Guidance	Marks
1	a		One mark for each correct box completed. Accept any suitable response. If unsure, please refer to your Team Leader or the Principal Examiner. e.g.  	Total **(4 marks)**
1	b		For each give; ▪ Specification point 3 x (2) ▪ an explanation 3 x (2) Accept any other suitable specification point. Explanation should qualify the specification point. If unsure, please refer to your Team Leader. e.g. Specification point The overall size of system so it fits behind the dashboard (2) Statement The system must fit in a box 20 x 20 x 80 mm (2) Specification point The overall cost should be as low as possible (2) Statement The system must cost less than £2 (2) Specification point If it's too heavy the car can't carry it (2) Explanation It should weigh less than 1Kg (2)	Total **(12 marks)**

1	c			Total **(1 mark)**
1	d		Marks will be awarded for Logic Gates (symbols drawn correctly, in the correct place and with the correct orientation) 3 marks Inputs to gates 5 marks Output to Light 1 mark Neatness (straight lines, well drawn gates) 1 mark e.g. 	Total **(10 marks)**
1	e	i	The light should come ON when either door is opened, stay on for 10 seconds and then turn OFF. 1 mark for each block in the correct place 1 mark for blocks and connections e.g. 	Total **(5 marks)**

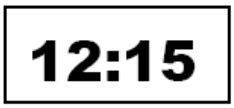
1	e	ii	1 mark for each correct response e.g. 1 Ability to turn light off manually. 2 Light to operate from door remote fob 3 Light to fade off rather than turn off Accept any suitable response. If unsure, please refer to your Team Leader or the Principal Examiner.	Total **(3 marks)**

Section B

Question	Part	Sub Part	Marking Guidance	Marks
2	a		Award 1 mark for the correct Component Name and correct tick in a box to show whether they are analogue or digital.	Total **(12 marks)**

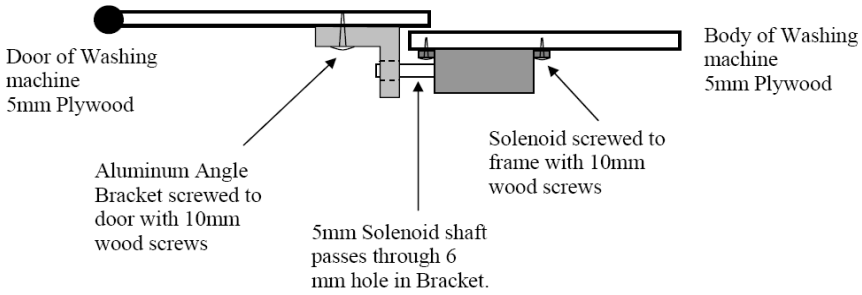
No.	Photo	Component Name	Analogue	Digital
1		Thermistor	✓	
2		LED		✓
3		Key Switch		✓
4		Reed Switch		✓
5		7 Segment Display		✓
6		Potentiometer or Pot	✓	
7		Solenoid		✓

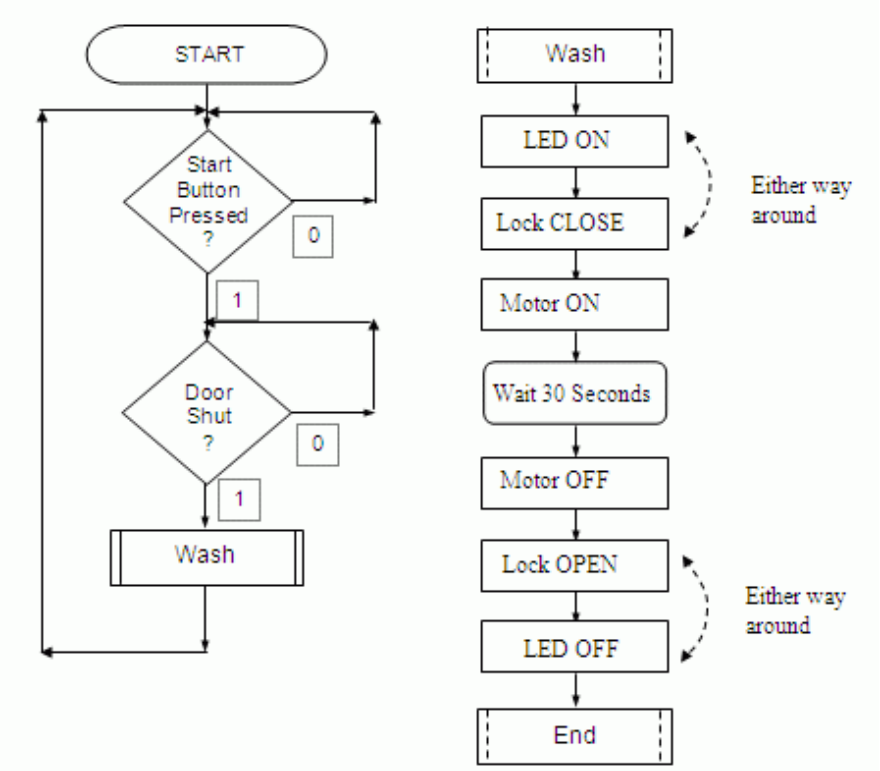
Note – 6 also Preset, variable resistor.

2	b		Analogue Digital FET Logic	Total **(1 mark)**
2	c	i	Recognisable analogue clock face e.g. as below or similar 	Total **(1 mark)**
2	c	ii	Recognisable digital clock display e.g. as below or similar 	Total **(1 mark)**
2	d	i	Give one advantage of recording data in a digital format Weak explanation single word, e.g. More compact (1 mark) Good explanation e.g. It allows accurate transmission and copying-allows error checking (2 marks) Accept any suitable response. If unsure, please refer to your Team Leader or the Principal Examiner.	Total **(2 marks)**
2	d	ii	Give one advantage of recording data in an analogue format Weak explanation single word, e.g. Accurate (1 mark) Good explanation e.g. It gives accurate reproduction as infinite values More closely replicates sound (2 marks) Accept any suitable response. If unsure, please refer to your Team Leader or the Principal Examiner.	Total **(2 marks)**

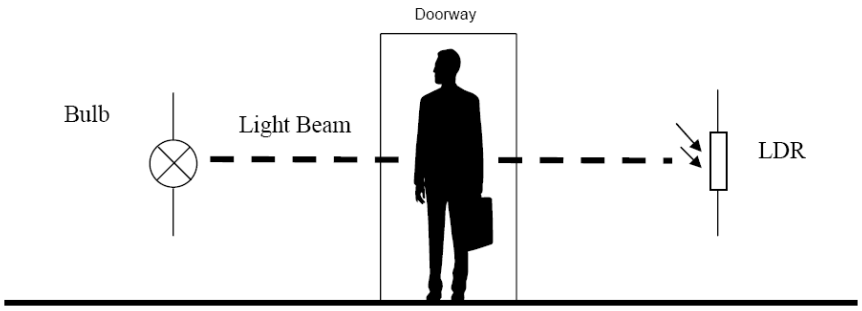
3	a	i	Two shafts rotating in close proximity, in opposite directions, at the same speed. Award marks for drawing a suitable system • that would transmit drive (1 mark) • that would turn the shafts in opposite directions (1 mark) • that would rotate both shafts at the same speed (1 mark)	Total **(3 marks)**
3	a	ii	Naming the system correctly i.e. “gears”, “gearbox”, “twisted belt”, “cogs” (1 mark)	Total **(1 mark)**
3	a	iii	Two shafts rotating a distance apart, in the same direction, at the same speed. Award marks for drawing a suitable system • that would transmit drive (1 mark) • that would turn the shafts in the same direction (1 mark) • that would rotate both shafts at the same speed (1 mark)	Total **(3 marks)**
3	a	iv	Naming the system correctly i.e.. “Sprocket & Chain”, “Belt & Pulley”, “Cog & Chain”, “Belt & Wheel”.	Total **(1 mark)**
3	a	v	Two shafts rotating in close proximity, in opposite directions, at different speeds. Award marks for drawing a suitable system • that would transmit drive (1 mark) • that would turn the shafts in the opposite direction (1 mark) • that would turn the shafts at different speeds (1 mark)	Total **(3 marks)**
3	a	vi	Naming the system correctly e.g. “gears”, ”gearbox”, “twisted belt & pulley”, “cogs”	Total **(1 mark)**
3	a	vii	Two shafts rotating at 90° to each other, in opposite directions, at the same speed. Award marks for drawing a suitable system • that would rotate (1 mark) • that would transmit drive around 90° (1 mark) • that would turn the shafts at the same speed (1 mark)	Total **(3 marks)**
3	a	viii	Naming the system correctly, i.e. “Bevel”, “Mitre”, “Crown Wheel”, “Friction Drive”	Total **(1 mark)**

3	b	i	Give an example and explain why friction is an advantage in a drive system 1 Mark incomplete response 2 Marks full response. E.g. Pulley & Belt systems need friction to transmit force Accept any suitable response. If unsure, please refer to your Team Leader or the Principal Examiner.	Total **(2 marks)**
3	b	ii	Give an example and explain why friction is a disadvantage in a drive system 1 Mark incomplete response 2 Marks full response. E.g. In gearboxes it wears parts and slows the drive Accept any suitable response. If unsure, please refer to your Team Leader or the Principal Examiner.	Total **(2 marks)**
4	a	i	Suggest a suitable plastic for the window in the door i.e. Acrylic, Polycarbonate, PET, Acetate. Perspex, Plexi-glass Accept any suitable response. If unsure, please refer to your Team Leader or the Principal Examiner.	Total **(1 mark)**
4	a	ii	Explain why the material that you have selected is suitable Weak explanation – single word, e.g. Tough (1 mark) Good explanation, e.g. Tough and easily cut to shape (2 marks) Accept any suitable response. If unsure, please refer to your Team Leader or the Principal Examiner.	Total **(2 marks)**
4	a	iii	Suggest a suitable component to operate the door lock i.e. “Solenoid”, “Pneumatic Cylinder”, “Electro Magnet” Accept any suitable response. If unsure, please refer to your Team Leader or the Principal Examiner.	Total **(1 mark)**

4	a	iv	Show how a component is mounted to the body of the washing machine and locks the door. Marks will be awarded for; • Component mounted correctly (1 mark) • Component able to lock the door (1 mark) • A good quality labelled sketch of the component (2 marks) Do not penalise if 4(a)(iii) is blank or different. Accept any suitable response. If unsure, please refer to your Team Leader or the Principal Examiner. E.g.  	Total **(4 marks)**

4	b		Complete the flowchart of the program for the micro controller by adding; Each correct output state of the decision boxes (4 marks) Use 1 for Yes and 0 for No Accept Y or N The following statements in the correct Process Boxes (7 marks) ▪ Lock OPEN ▪ LED OFF ▪ LED ON ▪ Motor ON ▪ Lock CLOSE ▪ Wait 30 Seconds ▪ Motor OFF Each correct connecting line, there are 3 missing lines (3 marks) e.g. 	Total **(14 marks)**
5	a	i	Accept any suitable response. If unsure, please refer to your Team Leader or the Principal Examiner. Feature 1 Suitable safety Feature, e.g. do not start with a door open	Total **(1 mark)**

5	a	ii	Accept any suitable response. If unsure, please refer to your Team Leader or the Principal Examiner. Reason for Feature 1 Suitable reason, e.g. to prevent injury to users	Total **(1 mark)**
5	a	iii	Accept any suitable response. If unsure, please refer to your Team Leader or the Principal Examiner. Feature 2 Suitable safety Feature, e.g. Overload protection	Total **(1 mark)**
5	a	iv	Accept any suitable response. If unsure, please refer to your Team Leader or the Principal Examiner. Reason for Feature 2 Suitable reason, e.g. to prevent the lift falling to the ground or burning out	Total **(1 mark)**
5	b	i	Accept any suitable response. If unsure, please refer to your Team Leader or the Principal Examiner. Suitable Task 1 E.g. regular oiling of the motor and gearbox	Total **(1 mark)**
5	b	ii	Accept any suitable response. If unsure, please refer to your Team Leader or the Principal Examiner. Explanation of Task 1 Weak explanation – single word, e.g. to prevent wear (1 mark) Good explanation, e.g. Without this the gears would wear due to friction (2 marks)	Total **(2 marks)**
5	b	iii	Accept any suitable response. If unsure, please refer to your Team Leader or the Principal Examiner. Suitable Task 2 E.g. regular safety checks	Total **(1 mark)**
5	b	iv	Accept any suitable response. If unsure, please refer to your Team Leader or the Principal Examiner. Explanation of Task 2 Weak explanation – single word, e.g. Safety (1 mark) Good explanation, e.g. To ensure that all safety systems were working (2 marks)	Total **(2 marks)**
5	c	i	Accept any suitable response. If unsure, please refer to your Team Leader or the Principal Examiner. Safety procedure e.g. interlocks to prevent the lift operating	Total **(1 mark)**

5	c	ii	Accept any suitable response. If unsure, please refer to your Team Leader or the Principal Examiner. Explanation of Safety procedure Weak explanation – single word, e.g. Turn lift off (1 mark) Good explanation, e.g. turn off power and padlock switch to prevent lift starting (2 marks)	Total **(2 marks)**
6	a		Your design must show A recognizable system (1 mark) Able to detect a person without being touched (1 mark) Components well drawn and labelled. (1 mark) e.g.  	Total **(3 marks)**

6	b		Describe the full operation of the system that you have drawn • Explain how the system senses a person • Refer to the components that you have drawn • Explain how it is used to improve safety PLEASE NOTE THE CANDIDATE WILL BE TESTED FOR QWC (QUALITY OF WRITTEN COMMUNICATION) IN THIS PART OF THE QUESTION. A high level response with a full and comprehensive explanation of all aspects of a suitable process. Response well structured with good use of appropriate design and technology terminology and showing a good grasp of grammar, punctuation and spelling. (7 – 8 marks) A medium level response with a good explanation of a suitable process, however with some aspects of the process omitted. Response fairly well structured with some use of design and technology terminology with a small number of errors in grammar, punctuation. (5 - 6 marks) A low level response with a limited explanation of one part of the process with several errors. Response poorly structured with little or no use of design and technology terminology and with several errors in grammar, punctuation and spelling. (3 - 4 marks) An attempt at a response, no relevant description presented. No use of design and technology terminology and multiple errors in grammar, punctuation and spelling. (1 - 2 marks). **An example of an 8 mark response** The system has a light bulb shining light across the doorway to an LDR. When a person breaks the light beam, the LDR cannot see the light. The person does not have to touch anything, just break the beam. When the light level falls on the LDR, its resistance increases. A PIC or transistor can be used to sense this change and send an output signal. This system improves lift safety as the lift door will not close if there is a person in the doorway. It also will not move off with a person in the doorway. A light beam is an improvement over a touch switch or pressure pad as it senses the person without having to make contact with them. **(8 marks)**	Total **(8 marks)**

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