



## **General Certificate of Education**

# **AS Design and Technology Systems & Control Technology 1556**

**SYST1**

**Materials, Components and Application**

## **Mark Scheme**

*2009 examination – June series*

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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**JUNE 2009 SERIES****COMPONENT NUMBER: SYST1****COMPONENT NAME: Materials, Components and Application****STATUS: Pre-Standardising****Section A**

Question	Part	Sub Part	Marking Guidance	Mark	Comments
1			Any valid description. E.g. A metal or alloy that does not contain iron. Example metal. E.g. Brass, Aluminium, Copper etc.	1 1	

Question	Part	Sub Part	Marking Guidance	Mark	Comments
2			Any valid description. E.g. A plastic that can be repeatedly softened and re-shaped. Example plastic. E.g. Acrylic, Polystyrene, ABS etc.	1 1	

Question	Part	Sub Part	Marking Guidance	Mark	Comments
3			2 poles 2 throws Correct explanation of how the two poles change to the two throws.	1 1 2	

Question	Part	Sub Part	Marking Guidance	Mark	Comments
4			Mention of feedback Output affects input e.g. Domestic central heating system.	1 2 1	

Question	Part	Sub Part	Marking Guidance	Mark	Comments
5			Correct sketch of any suitable mechanism e.g. Cam and Follower, Crank & Slider. Further marks to be awarded for: Indication of rotary input. Indication of reciprocating output.	2 1 1	

Question	Part	Sub Part	Marking Guidance	Mark	Comments
6			Correct sketch of any suitable mechanism. Further marks to be awarded for: Indication of rotary input. Indication of oscillating output.	2 1 1	

**(Total 20 marks)**

## Section B

Question	Part	Sub Part	Marking Guidance	Mark	Comments
7	a		<p>Answers should include some or all of the following observations:</p> <p><b>Transfers</b> Select transfers, clean copper-clad board, rub-down transfers onto board, etch board, wash board, remove transfers, drill board and/or any other relevant stage.</p> <p><b>Photo-etch</b> Create PCB mask, print onto translucent paper, use UV box, develop image, wash board, etch board, drill board and/or any other relevant stage.</p> <p><b>Milling</b> Create PCB CAD design, convert to CNC file, attach copper-clad board to bed of miller, set Z offsets for end of mill cutter and drill, fit end mill, run programme to mill away unwanted copper, fit drill, run programme to drill component holes and/or any other relevant stage.</p> <p>Simplistic answer giving basic outline of PCB production but lacking detail and correct sequences.</p> <p>Good answer giving detail of the process and an indication of the correct sequence of operations.</p> <p>Excellent answer giving in-depth detail of PCB production with correct use of technical terminology and a logical sequence of operations.</p>	<p>0 – 2</p> <p>3 – 5</p> <p>6 - 8</p>	Max 8 marks
7	b		<p>Any two valid health and safety risks along with control measures E.g. UV light is dangerous to eyes. Ensure UV box is shut during use</p> <p>Developer is caustic. Wear gloves and goggles</p> <p>Etchant is corrosive. Wear gloves and goggles</p>	2 x 2	Max 4 marks

			<p>PCB swarf from drilling is an irritant to eyes. Wear goggles</p> <p>Solder fumes are an irritant. Ensure fume extraction, etc.</p>		
7	c		<p>Any four valid points briefly discussed, or two points discussed in greater depth for each prototyping system.</p> <p>e.g. Breadboard          Requires 'real' components          Time consuming to wire up complex circuits          Faultfinding can be difficult on large circuits          Relatively low-cost method prototyping          Gives an indication of the size of the finished circuit          Gives a better idea of what the end product will look like</p> <p>e.g. Circuit Simulation Software          Does not require the purchase of 'real' components          Requires expensive computer hardware to operate          Faultfinding easier to undertake than on Breadboard          Simulation of components only as good as the parameters built into the software</p>	2 x 4	Max 8 marks

**(Total 20 marks)**

Question	Part	Sub Part	Marking Guidance	Mark	Comments
8	a		Situation Why it is a problem Solution	2 x 1 2 x 1 2 x 1	Max 6 marks
8	b		Application of force Suitable force Suitable materials Suitable mechanism/machine  e.g. rim, disc, band, drum, magnetic, regenerative brakes etc.  Quality of sketches.	1 1 1 1    2 x 1	Max 10 marks
8	c		$48\text{N} \times 50\text{mm} = \text{Effort} \times 120\text{mm}$ $\text{Effort} = 2400/120$ $\text{Effort} = 20\text{N}$ Correct answer with units but no working.  Carry-through errors	1 1 2 4  Up to 2	

**(Total 20 marks)**

## Section C

Question	Part	Sub Part	Marking Guidance	Mark	Comments
9	a		Design shows a system which would be capable of lowering the bollard.  Method of reducing speed.  Linear motion  The design should be capable of coping with load (i.e. the mass of the bollard).  There should be some form of guidance system.	Up to 2  2  1  Up to 2  Up to 1	Max 8 marks
9	b		Device e.g. DPDT switch Correct connections Limit switches How limit switches work	2 2 2 x 1 2	Max 8 marks
9	c		Input transducer capable of detecting dark/light. Process circuit. Suitable resistors and LEDs	Up to 2  Up to 2 Up to 2	Max 6 marks
9	d		Output LEDs mounted Sensor mounted Limit switch mounted Drive system Reversing circuit connected Quality of solution	1 1 2 x 1 2 2 2	Max 10 marks
9	e		Explanation of problems that may be encountered in the installation and manufacture of the system:  Candidate recognises that there are issues with making a suitable hole in the ground for the bollard and associated electro-mechanical systems. Problems of water-proofing, providing power to the system etc.  Candidate explains in detail the problems associated with sinking the system into an aperture in the ground, outlines the problems of connecting the mechanical system and the housing to the bollard via a framework or equivalent, considers load and mass, power requirements, waterproofing, health and safety issues etc.	0 - 2  3 - 4	Max 4 marks

9	f		<p>List of suitable materials:</p> <p>Materials are listed or stated on drawings and are realistic for the context i.e. Steel, Aluminium. They show some evidence of fixings being used i.e. Rivets, bolts, welding.</p> <p>Materials stated, realistic and demonstrating understanding i.e. Mild Steel, Galvanised steel, Aluminium alloy. Evidence on drawings of fixings to bollard, housing and physical location i.e. Machine screws, rawlbolts, concrete.</p>	<p>0 - 2</p> <p>3 - 4</p>	<p>Max 4 marks</p>
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**(Total 40 marks)**