Version 1: 1005

ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Secondary Education

Design and Technology: Systems and Control Technology Foundation Tier
Specification 3546

Mark Scheme
2005 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

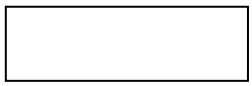
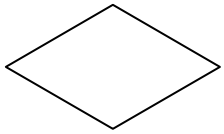
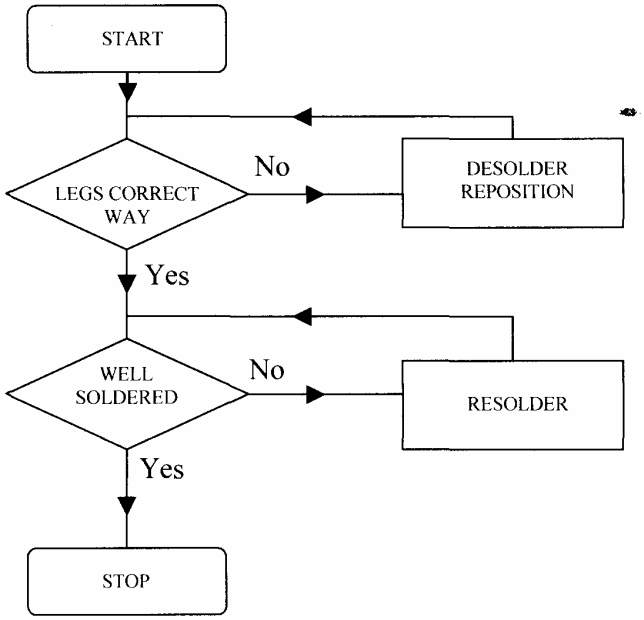
future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

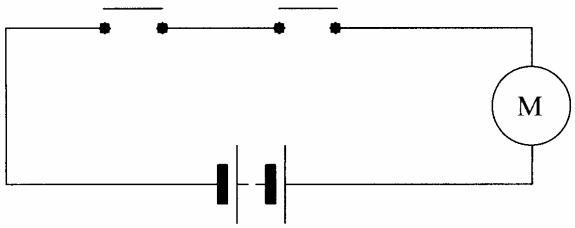
Foundation Tier

Section A Mechanisms Focus

	Question 1				
	(a)	**(i)**	Correctly labelling the driven gear as faster. (A)		(1 mark)
		(ii)	Formula = driven/driver. Working = 30/90 Answer = 3 or 1:3 (or 3:1 or 0.33)	1 mark 1 mark 1 mark	(3 marks)
	(b)	**(i)**	A comment about increased force or reduced effort		(1 mark)
		(ii)	Any suitable metal named (e.g. aluminium alloy) A generic term. (Metal)	2 marks 1 mark	(2 marks)
		(iii)	Comment about strength to weight or ease of manufacture **(Accept strong)**	1 mark	(1 mark)
					Total 8 marks

	Question 2			
	(a)	Fixed resistor (**Accept resistor)**	1 mark	
		Thermistor (temperature sensor)	1 mark	
		Potentiometer (VR or variable resistor)	1 mark	
		LED or light emitting diode	1 mark	
		Battery–cell or cells	1 mark	
		LDR or light dependent resistor	1 mark	(6 marks)
	(b)	Senses the presence or absence of light – appropriate example	2 marks	
		Senses tilting or lateral movement – appropriate example	2 marks	
		Senses movement of an item or pressure – appropriate example	2 marks	(6 marks)
	(c)	**(i)** Logic	1 mark	
		(ii) AND OR (1 each in correct order)	2 marks	(3 marks)
		(iii) 0 0 0 1	1 mark 1 mark 1 mark 1 mark	(4 marks)
				Total 19 marks

	Question 3			
	(a)	Process 	1 mark	
		Input/Output 	1 mark	
		Decision 	1 mark	(3 marks)
	(b)			
			6 marks	
		Correct sequence	2 marks	
		Loops	2 marks	
		Yes/No	2 marks	
		Arrows: all drawn **(1 or more drawn = 1 mark)**	2 marks	(14 marks)
		Quality		
				Total 17 marks

	Question 4				
	(a)	**(i)**	Thermistor or A	1 mark	
		(ii)	Temperature or heat / cold	1 mark	(2 marks)
	(b)	Potentiometer or variable resistor or B or pre-set or VR			(1 mark)
	(c)	Correct position of thermistor		1 mark	
		Correct symbol for thermistor		1 mark	
		Quality of drawing bottom symbol correctly **(any recognisable symbol for 1 mark)**		2 marks	
		Correct position of variable resistor		1 mark	
		Correct symbol for variable resistor		1 mark	
		Quality of drawing top symbol correctly **(any recognisable symbol for 1 mark)**		2 marks	(8 marks)
	(d)	**(i)**			
			Quality of drawing	2 marks	
			Correct use of AND function - 2PTM in series **(1 PTM in series = 1 mark)**	2 marks	
			4 symbols correct in correct position **(3 symbols correct in correct position = 3 marks)** **(2 symbols correct in correct position = 2 marks)** **(1 symbol correct in correct position = 1 mark)**	4 marks	
			Motor output only **(Any additional output = 1 mark)** **(Motor not controllable = 0 marks)**	2 marks	(10 marks)
		(ii)	**1.** Switch 2. Microswitch, reed switch, pressure pad, PTM switch. **(NOT LDR)**	1 mark	
			2. Output. Machine rotates	1 mark	(2 marks)
					Total 23 marks

	Question 5				
	(a)	1 mark for each appropriate answer to a maximum of 2 marks (e.g. use a soldering iron stand, wear safety goggles to avoid splashing)	2 marks		
	(b)	1 mark for each appropriate answer to a maximum of 2 marks (e.g. ensure work is properly held, remove chuck key before use) **(No credit for eye protection if glasses/goggles mentioned above)**	2 marks		
	(c)	1 mark for each appropriate answer to a maximum of 2 marks (e.g. wear gloves for handling sharp edges, avoid lifting heavy objects unaided) **(Do NOT accept running)**	2 marks		(6 marks)
				Total 6 marks	

	Question 6				
	(a)	**1 and 2.** Ensure requirements are safety related and appropriate to the goods lift. (2 marks for **<u>each</u>** appropriate statement clearly related to safety, 0 marks if inappropriate) – to a maximum of 4 marks.	4 marks		
		Ensure method of satisfying is appropriate to the stated requirement. (2 marks for a totally appropriate method, 1 mark for a partially workable method, 0 marks if inappropriate) – to a maximum of 4 marks. (e.g. Microswitch on doors – uses non conductive materials – switches are well insulated – maximum capacity clearly labelled etc).	4 marks		(8 marks)
	(b)	Any two appropriate methods (2 marks if well described, 1 mark if simply stated) – to a maximum of 4 marks Examples could be: Dust proof casings, using a fuse, correct mounting, protection from moisture etc.			(4 marks)
				Total 12 marks	

	Question 7				
	(a)	**(i) (ii)**	Ensure responses are related to product quality. (2 marks for **<u>each</u>** well explained and appropriate answer, 1 mark for simple answer but lacking description) – to a maximum of 4 marks in total for (i) and (ii). Examples could be: Easier/quicker – with qualification, consistent standards, drawings cannot be misinterpreted, components automatically produced to match the design)		(4 marks)

	(b)	**(i) (ii)**	1 mark for each appropriate to a maximum of 4. Examples could be: Allows for modular construction, Easier to modify the product, Cheaper to replace when they fail		(4 marks)
	(c)	**(i)**	Ensure response is related to visual checking. 2 marks for well explained, 1 mark for simple answer but lacking description. Examples could be: Polarity of components, Quality of soldered connections, Touching or unscreened wires	2 marks	
		(ii)	Ensure response is related to electronic checking. 2 marks for well explained and appropriate answer, 1 mark for simple one word answers but lacking description e.g. soldering tracks. Examples could be: Checking component values using a meter, Checking output voltages using a meter	2 marks	(4 marks)
					Total 12 marks

	Question 8			
	(a)	Suitability of mechanism: Will reciprocate continuously = 4 marks Moves one way = 3 marks Some movement = 2 marks An attempt = 1 mark	4 marks	
		Notes on construction/materials/components/operation: 1 mark for each item (follow through in body of script)	4 marks	
		Quality of drawing: Well produced in appropriate style = 2 marks Recognisable as a response = 1 mark	2 marks	(10 marks)
	(b)	Facility to pause at top/bottom: Includes a dwell at top and bottom = 4 marks Would pause at top or bottom = 3 marks Stops = 2 marks An attempt = 1 mark	4 marks	
		Notes explaining how system works: Detailed explanation = 3 marks System explained = 2 marks Simple, labelling only = 1 mark	3 marks	
		Quality of drawing: Well produced in appropriate style = 2 marks Recognisable as a response = 1 mark	2 marks	(9 marks)

					Total 19 Marks

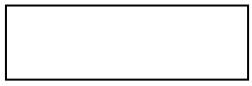
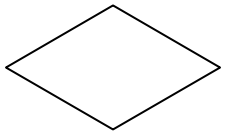
	Question 9			
	(a)	Two		(1 mark)
	(b)	30 seconds		(1 mark)
	(c)	0		(1 mark)
	(d)	Second road sensor in correct position = 3 marks Badly positioned after the bollards = 2 marks An attempt = 1 mark		(3 marks)
		Statement that sensor 1 takes bollard down Statement that sensor 1 brings bollard up Reason for placing sensor 2 after bollard	1 mark 1 mark 1 mark	(3 marks)
				Total 9 marks

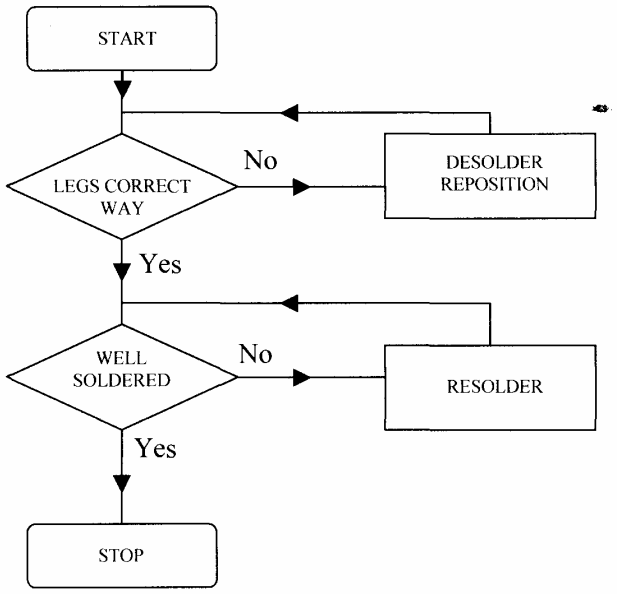
Section B Pneumatics Focus

	Question 1				
	(a)	**(i)**	A		(1 mark)
		(ii)	Formula = pressure * area (if working shows understanding give credit) Working = 0.5 * 200 Answer = 100N **(do not penalise units)**	1 mark 1 mark 1 mark	(3 marks)
	(b)	**(i)**	Force will lift the press or a comment about piston return control		(1 mark)
		(ii)	Any suitable lightweight plastic named e.g. PVC = 2 marks A generic term e.g. clear plastic = 1 mark		(2 marks)
		(iii)	Comment about strength to weight or ease of manufacture. Not affected by moisture. **(Must apply to material mentioned)**		(1 mark)
					Total 8 marks

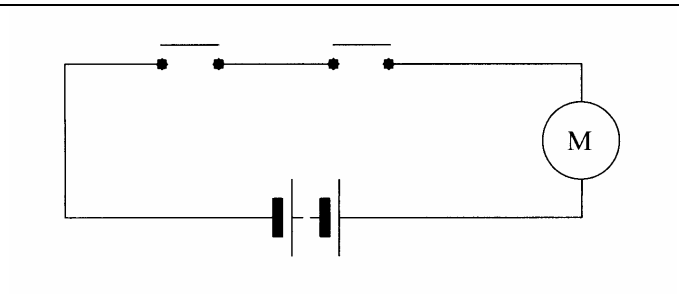
	Question 2			
	(a)	Reservoir Pilot signal or line Spring return Main air supply	1 mark 1 mark 1 mark 1 mark	

		Exhaust air Shuttle valve		1 mark 1 mark	(6 marks)
	(b)	Senses the presence or absence of light - appropriate example Senses tilting or lateral movement – appropriate example Senses movement of an item – appropriate example		2 marks 2 marks 2 marks	(6 marks)
	(c)	**(i)**	Logic		(1 mark)
		(ii)	AND OR (1 each in correct order)		(2 marks)
		(iii)	0 0 0 1	1 mark 1 mark 1 mark 1 mark	(4 marks)
					Total 19 marks

	Question 3				
	(a)	Process 		1 mark	
		Input/Output 		1 mark	
		Decision 		1 mark	(3 marks)

	(b)			
		Correct sequence Loops Yes/No Arrows Quality	6 marks 2 marks 2 marks 2 marks 2 marks	(14 marks)
				Total 17 marks

	Question 4					
	(a)	**(i)**	Thermistor or A		1 mark	
		(ii)	Temperature or heat / cold		1 mark	(2 marks)
	(b)	Potentiometer or variable resistor or B or pre-set or VR				(1 mark)
	(c)	Correct position of thermistor Correct symbol for thermistor Quality of drawing bottom symbol correctly **(any recognisable symbol for 1 mark)** Correct position of variable resistor Correct symbol for variable resistor Quality of drawing top symbol correctly **(any recognisable symbol for 1 mark)**			1 mark 1 mark 2 marks 1 mark 1 mark 2 marks	(8 marks)

	(d)	**(i)**	 Quality of drawing Correct use of AND function - 2PTM in series **(1 PTM in series = 1 mark)** 4 symbols correct in correct position **(3 symbols correct in correct position = 3 marks)** **(2 symbols correct in correct position = 2 marks)** **(1 symbol correct in correct position = 1 mark)** Motor output only **(Any additional output = 1 mark)** **(Motor not controllable = 0 marks)**	2 marks 2 marks 4 marks 2 marks	(10 marks)
		(ii)	**1.** Switch 2. Microswitch, reed switch, pressure pad, PTM switch. **(NOT LDR)** **2.** Output. Machine rotates	1 mark 1 mark	(2 marks)
					Total 23 marks

	Question 5				
	(a)		1 mark for each appropriate answer to a maximum of 2 marks (e.g. use a soldering iron stand, wear safety goggles to avoid splashing)	2 marks	
	(b)		1 mark for each appropriate answer to a maximum of 2 marks (e.g. ensure work is properly held, remove chuck key before use) **(No credit for eye protection if glasses/goggles mentioned above)**	2 marks	
		(c)	1 mark for each appropriate answer to a maximum of 2 marks (e.g. wear gloves for handling sharp edges, avoid lifting heavy objects unaided) **(Do NOT accept running)**	2 marks	(6 marks)
					Total 6 marks

	Question 6			
	(a)	**1 and 2.** 2 Ensure requirements are safety related and appropriate to the goods lift. (2 marks for **each** appropriate statement clearly related to safety, 0 marks if inappropriate) – to a maximum of 4 marks.	4 marks	
		Ensure method of satisfying is appropriate to the stated requirement. (2 marks for a totally appropriate method, 1 mark for a partially workable method, 0 marks if inappropriate) – to a maximum of 4 marks. (e.g. Microswitch on doors – uses non conductive materials – switches are well insulated – maximum capacity clearly labelled etc).	4 marks	(8 marks)
	(b)	Any two appropriate methods (2 marks if well described, 1 mark if simply stated) – to a maximum of 4 marks Examples could be: Dust proof casings, using a fuse, correct mounting, protection from moisture etc.		(4 marks)
				Total 12 marks

	Question 7				
	(a)	**(i) (ii)**	Ensure responses are related to product quality. 2 marks for well explained and appropriate answer, 1 mark for appropriate answer but lacking description. Examples could be: Easier/quicker – with qualification, consistent standards, drawings cannot be misinterpreted, components automatically produced to match the design.		(4 marks)
	(b)	**(i) (ii)**	1 mark for each appropriate Examples could be: allows for modular construction, easier to modify the product, cheaper to replace when they fail		(4 marks)
	(c)	**(i)**	Ensure response is related to visual checking. 2 marks for well explained answer, 1 mark for simple answer but lacking description Examples could be: Polarity of components, quality of soldered connections, touching or unscreened wires.	2 marks	

		(ii)	Ensure response is related to electronic checking, 2 marks for well explained and appropriate answer, 1 mark for simple answer but lacking description (e.g. soldering tracks). Examples could be: Checking component values using a meter, checking output voltages using a meter	2 marks	(4 marks)
					Total 12 marks

	Question 8			
	(a)	Suitability of pneumatic system: Will reciprocate continuously = 4 marks Moves one way = 3 marks Some movement = 2 marks An attempt = 1 mark Notes on construction/materials/components/operation: **1 mark for each item (follow through in body of script)** (circuit drawn = construction) Quality of drawing: Well produced in appropriate style = 2 marks Recognisable as a response = 1 mark	4 marks 4 marks 2 marks	(10 marks)
	(b)	Facility to pause at top/bottom includes dwell (2) Pause at top or bottom = 3 marks Stops = 2 marks An attempt = 1 mark Notes explaining how system works: Detailed explanation = 3 marks Some aspects explained = 2 marks Simple labelling = 1 mark Quality of drawing: Well produced in appropriate style = 2 marks Recognisable as a response = 1 mark	4 marks 3 marks 2 marks	(9 marks)
				Total 19 marks

	Question 9			
	(a)	Two		(1 mark)
	(b)	30 seconds		(1 mark)
	(c)	0		(1 mark)
	(d)	Second road sensor drawn and correctly positioned = 1 mark Badly positioned after the bollards = 2 marks An attempt = 1 mark A statement that sensor 1 takes bollard down = 1 mark A statement that sensor 2 takes bollard up = 1 mark Reason for placing bollard after the sensor = 1 mark	3 marks 3 marks	(6 marks)
				Total 9 marks
			Total marks on paper 125	