



**General Certificate of Education (A-level)
June 2012**

**Design and Technology:
Systems and Control
Technology**

SYST3

(Specification 2555)

Unit 3: Design and Manufacture

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 events which all examiners participate in and is the scheme which was used by them in this examination. The standardisation process 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 standardisation each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, examiners encounter unusual answers which have not been raised they are required to refer these to the Principal Examiner.

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Question 1			
0 1	References made to – The power source – availability – easy of transmission – ease of conversion – possible output forms – types of prime mover – speed of output – force produce – safety – use in hazardous situations – maintenance – cost – suitability for control situations – interfacing with other systems – interlocking – feedback – speed of response – possible uses – etc. Each point 1 mark with relevant reason 2 marks	3 x 8 marks	Max 24 marks
0 2	Feedback ensures that a operation is complete – feedback provides continual monitoring – process cannot continue until condition met Each point 1 mark with relevant reason 2 marks	4 marks	
Question 2			
0 3	Identification of suitable device <i>E.g. Clutch, brakes, ballpoint, karabiner, descender, knot, shoe sole, tyre, paper feed on printer etc.</i> Quality of sketch (1) showing where friction occurs (1) Basic (1) Detailed (2) Explanation of how the frictional force is achieved Basic (1) Detailed (2) Explanation of why friction is required Maximum for Question 4 x 7 marks	1 mark 2 marks 2 marks 2 marks	28 marks
Question 3			
0 4	Quality of sketch Input clearly identified as rotary motion Output reciprocating motion Output guided Explanation (1) and application (1) 2 x 6 marks max	1 mark 1 mark 1 mark 1 mark 2 marks	12 marks
0 5	Quality of sketch Input clearly identified as rotary motion Output rotary motion at right angles Explanation (1) and application (1) 2 x 5 marks max	1 mark 1 mark 1 mark 2 marks	10 marks
0 6	Friction has to be overcome Use of bearings or lubrication Overcoming the mass of the object Reducing the mass of the object Energy loss to sound or heat Better fitting / polished surfaces etc. Each relevant point or reason (1) Or any other suitable reason	2 x 3 marks	Max 6 marks

Question 4			
0 7	Harnessing – Capture (1) force (1) movement (1) Conversion to electrical output – basic (1) detailed (2) Identification of each energy conversion (1) Quality of communication	3 marks 2 marks 3 marks 2 marks	Max 10 marks
0 8	Harnessing – Capture (1) force (1) movement (1) Conversion to electrical output – basic (1) detailed (2) Identification of each energy conversion (1) Quality of communication	3 marks 2 marks 3 marks 2 marks	Max 10 marks
0 9	Reference could be made to – Coal readily available – Oil or gas running out – Needs to be imported – Power stations compact – proven technology – pollution – Carbon dioxide – acid rain – Etc. Each relevant point (1) with suitable reason (2)	8 marks	
Question 5			
1 0	Suitable light source (1) and sensor (1) Suitable switching circuit operated by sensor – Component parts (2 max) correct connections (2 max) Suitable activation system for D/A cylinder – Valve(s) (1) connections (2 max) D/A cylinder drawn Suitable restrictor (1) to control outward movement (1) Correct connection (1) to ensure operation (1) Description – Basic (2 max) – Detailed (4 max)	2 marks 4 marks 3 marks 1 mark 2 marks 2 marks 4 marks	Max 16 marks
1 1	Suitable sensing (1) and activation system (1) Suitable pulse shaping circuit Suitable counting system Suitable decoder (1) and matching display (2) Timing system (1) with interlock (1) correctly connected (1) Description - Basic (2 max) – Detailed (4 max)	2 marks 1 mark 1 mark 3 marks 3 marks 4 marks	Max 12 marks
Question 6			
1 2	Specific situation / example stated Input identified Suitable method (1) with output identified (1) Description Limitations 4 x 7 marks max	1 mark 1 mark 2 marks 2 marks 2 marks	Max 28 marks

Note:

There are often many ways to solve a problem, the mark scheme attempts to reward candidates independent of the system they decided to use. The descriptions identify how marks can be obtained; marks are awarded up to the total for that question or part of question.