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GCE 2004
June Series

ASSESSMENT and QUALIFICATIONS ALLIANCE

Mark Scheme

Design and Technology: Systems and Control Technology
(Subject Code 6556 Unit 6)

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The answers given in the following mark schemes are neither exhaustive nor exclusive. Candidates whose answers do not appear directly on the mark scheme, but who have demonstrated knowledge, understanding, or skills relevant to the question will receive appropriate credit for their answers.

Further copies of this Mark Scheme are available from:

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GENERAL CERTIFICATE OF EDUCATION

Design and Technology: Systems and Control Technology: Unit 6

Summer Examination 2004

Section A – Materials and Components

Question A1

(a) Must hold components securely, fabricated, possible colourful, batch produced, electrically safe, possible moulding to front. Aluminium or steel frame, plastic moulding at front.

(b) Weather resistant, waterproof, vandal resistant, capable of taking surface finish, fabricated or moulded, batch produced, sheet steel or aluminium, suitable vacuum forming plastic.

(c) Colourful, non toxic, insulator, capable of moulding into complex shape, possible textured finish, mass produced, injection moulded or vacuum formed, suitable plastic to match process.

(d) Will be mass produced, large forces involved, needs accurate machining, cast, heat-treated, must be hard and wear resistant, Steel. (4 x 6 marks)

Question A2

(a) DC Motors
Available in many sizes, high speed, low torque, work of many voltages, need gearing down to reduce speed, increase torque, over run when switched off, need a sensing system, need feedback, prone to hunting.

Stepper Motors
Precise steps, steps normally limited to 1.8 or 7.5 degrees, need gearing to provide more precise movement, digital output, low maximum speed, need ramping for accurate control, can be used in open loop systems. (12 marks)

(b) Method of converting rotary to linear motion (4 marks)
Suitable speed of movement (1 mark)
Suitable sensing system (2 marks)
Feedback system (1 mark)
Comparator and Control system (4 marks)

Section B – Design and Market Influences

Question B3

Use of internet for communication, research
CAD, CAM JIT, modelling, simulation, mathematical analysis, stock control, market research etc.
Examples must be supported by reasons related to the product or system selected. (24 marks)

Question B4

(a) Reference to ease of construction, visual representation for analysis, ease of modification, ability to handle, ease of change/modification, identification of problems, ability to test, evaluate by third parties, identify problems in manufacturing process, etc. (16 marks)

(b) Ease of construction, repeatability, accuracy, use of less skilled workforce, etc. (8 marks)

Section C – Processes and Manufacture

Question C5

(a) Method of sensing wind (2 marks)
Suitable transducer (2 marks)
Modification/transmission of signal (2 marks)
Reference to time base (2 marks)
Suitable Output (2 marks)
(2 x 10 marks)

(b) Comparison with a set instrument, over a range of wind speeds, in controlled conditions. (4 marks)

Question C6

Explanation of the method of method of conversion

Harnessing power (2 marks)
Conversion to electrical output (2 marks)
Identification of problems (2 marks)
Methods of overcoming these problems (2 marks)
(3 x 8 marks)

Candidates should identify the need for a back up system – e.g. A diesel generator for the refrigeration.