



Rewarding Learning

**General Certificate of Secondary Education
January 2014**

Engineering

Paper 1

Assessment Unit 3

assessing

Engineering Technology

[GEE31]

THURSDAY 9 JANUARY, AFTERNOON

**MARK
SCHEME**

General Marking Instructions

Introduction

Mark schemes are intended to ensure that the GCSE examinations are marked consistently and fairly. The mark schemes provide markers with an indication of the nature and range of candidates' responses likely to be worthy of credit. They also set out the criteria which they should apply in allocating marks to candidates' responses. The mark schemes should be read in conjunction with these general marking instructions.

Assessment Objectives

Below are the assessment objectives for GCSE Engineering.

Candidates must:

- recall, select and communicate their knowledge and understanding of engineering in a range of contexts (AO1);
- apply skills, knowledge and understanding, including quality standards, in a variety of contexts, and plan and carry out investigations and tasks involving a range of tools, equipment, materials and components (AO2); and
- analyse and evaluate products, make reasoned judgements and present conclusions (AO3).

Quality of candidates' responses

In marking the examination papers, examiners should be looking for a quality of response reflecting the level of maturity which may reasonably be expected of a 16-year-old which is the age at which the majority of candidates sit their GCSE examinations.

Flexibility in marking

Mark schemes are not intended to be totally prescriptive. No mark scheme can cover all the responses which candidates may produce. In the event of unanticipated answers, examiners are expected to use their professional judgement to assess the validity of answers. If an answer is particularly problematic, then examiners should seek the guidance of the Supervising Examiner.

Positive marking

Examiners are encouraged to be positive in their marking, giving appropriate credit for what candidates know, understand and can do rather than penalising candidates for errors or omissions. Examiners should make use of the whole of the available mark range for any particular question and be prepared to award full marks for a response which is as good as might reasonably be expected of a 16-year-old GCSE candidate.

Awarding zero marks

Marks should only be awarded for valid responses and no marks should be awarded for an answer which is completely incorrect or inappropriate.

Type of mark schemes

Mark schemes for tasks or questions which require candidates to respond in extended written form are marked on the basis of levels of response which take account of the quality of written communication.

Other questions which require only short answers are marked on a point for point basis with marks awarded for each valid piece of information provided.

Levels of response

Tasks and questions requiring candidates to respond in extended writing are marked in terms of levels of response. In deciding which level of response to award, examiners should look for the “best fit” bearing in mind that weakness in one area may be compensated for by strength in another. In deciding which mark within a particular level to award to any response, examiners are expected to use their professional judgement. The following guidance is provided to assist examiners.

- **Threshold performance:** Response which just merits inclusion in the level and should be awarded a mark at or near the bottom of the range.
- **Intermediate performance:** Response which clearly merits inclusion in the level and should be awarded a mark at or near the middle of the range.
- **High performance:** Response which fully satisfies the level description and should be awarded a mark at or near the top of the range.

Marking calculations

In marking answers involving calculations, examiners should apply the “own figure rule” so that candidates are not penalised more than once for a computational error.

Quality of written communication

Quality of written communication is taken into account in assessing candidates’ responses to all tasks and questions that require them to respond in extended written form. These tasks and questions are marked on the basis of levels of response. The description for each level of response includes reference to the quality of written communication.

For conciseness, quality of written communication is distinguished within levels of response as follows:

Level 1: Quality of written communication is limited.

Level 2: Quality of written communication is satisfactory.

Level 3: Quality of written communication is excellent.

In interpreting these level descriptions, examiners should refer to the more detailed guidance provided below:

Level 1 (Limited): Candidates presentation, spelling, punctuation and grammar is limited. The candidate makes a limited selection and use of an appropriate form and style of writing. The organisation of material may lack clarity and coherence. There is little use of specialist vocabulary.

Level 2 (Satisfactory): Candidates presentation, spelling, punctuation and grammar is satisfactory. The candidate makes a satisfactory selection and use of an appropriate form and style of writing supported with appropriate use of diagrams as required. Relevant material is organised with some clarity and coherence. There is some use of specialist vocabulary.

Level 3 (Excellent): Candidates presentation, spelling, punctuation and grammar is excellent. The candidate successfully selects and uses the most appropriate form and style of writing, supported with precise and accurate use of diagrams where appropriate. Organisation of relevant material is excellent. There is excellent use of appropriate specialist vocabulary.

			AVAILABLE MARKS	
1	(a)	Gears on a bike Grandfather clock (2 × [1])	[2]	4
	(b)	Builder's scaffolding Metal barbecue (2 × [1])	[2]	
2	(a)	Wing nut Used with a bolt. The projections enable thumb and forefinger leverage in turning. (2 × [1])	[2]	10
	(b)	Jubilee Clip The clip is designed to hold a soft, pliable hose onto a rigid circular pipe of smaller diameter, e.g. attaching a nozzle to a hosepipe Others considered (2 × [1])	[2]	
	(c)	Chuck key Use to tighten the chuck on a pedestal drill (2 × [1])	[2]	
	(d)	Knurling process Used for grip (2 × [1]) To smooth the edges of the material (2 × [1])	[2]	
	(e)	Draw filing Removes cross filing marks/make it smoother (2 × [1])	[2]	
3	(a)	Faster lead times Consistency across all products Others considered (2 × [2])	[4]	7
	(b)	Appropriate product identified [1] Appropriate CAM technique described relating to the product identified [2]	[3]	
4	(a)	A smart material can be described as a material that has a useful response to external influences or stimuli. Others considered	[2]	8
	(b)	Examples: Metal springs, light bulb filament, heat shrink tubing, smart wire, piezoelectric material, polymorph, etc. (2 × [1]) Any appropriate use (2 × [2])	[2] [4]	

			AVAILABLE MARKS	
5	(a)	Machine A: Lathe [1] Machine B: Mill [1]	[2]	10
	(b)	Machine A: Turning a cylindrical piece of material down to a reduced cross section Others considered [2] Machine B: Milling a slot out of a piece of material Others considered [2]	[4]	
	(c)	You don't need a computer trained person to operate it or program it before using it. Cheaper to buy for the manufacturer Others accepted (2 × [2])	[4]	
6	(a)	High set up cost Staff need trained Others considered	[2]	8
	(b)	They can work 24/7 They can operate in hazardous/dangerous conditions Others considered	[2]	
	(c)	(i) Robotic control can be set to follow a similar pattern for each car part with 'lead through' programming giving a consistent level of finish. Others considered	[2]	
		(ii) In hazardous environments, robotic control can be employed from a remote distance using sensors and imaging equipment. Others considered	[2]	
7	(a)	The Internet Mobile telephones Others considered	[1]	7
	(b)	Products can be manufactured remotely off site Others considered	[2]	
	(c)	(i) Material can be bought in on a just in time basis. No excess material, no stockpiles of material etc. Others considered	[2]	
		(ii) Everything can be stored electronically and shared electronically, especially with the use of the Internet. Others considered	[2]	

			AVAILABLE MARKS
8	(a)	<p>Appropriate definition of any of the three terms listed</p> <p>Annealing: This is carried out to soften metal and to relieve internal stresses. The metal is heated to the required temperature and allowed to cool down as slow as possible.</p> <p>Case Hardening: This is a method of making low carbon steel very hard on the outside while leaving its centre very tough.</p> <p>Work hardening: When a metal is hammered or shaped when cold it becomes hard and brittle at the point where the cold working occurs. (2 × [2])</p>	[4]
	(b)	<p>(i) Appropriate description of how the chisel is tempered.</p> <p>(ii) So that it does not chip when being used. Others considered</p>	[2] [2]
	(c)	Wear appropriate clothing Others considered	[2]
			10
9	(a)	<p>(i) Quality control is a process by which entities review the quality of all factors involved in the production process. Others considered</p> <p>(ii) Automation is the use of control systems and information technologies to reduce the need for human work in the production of goods and services. Others considered</p>	[2] [2]
	(b)	<p>(i) Appropriate product stated Appropriate quality control check stated relating to the product highlighted</p> <p>(ii) The product will be safe to use Others considered</p>	[2] [2]
			8
10	(a)	<p>Reduced lead times Products made much quicker Less waste of materials Others considered (2 × [2])</p>	[4]
	(b)	<p>Range: Larger range available Availability: Widely available through the use of the Internet. Others considered (2 × [2])</p>	[4]
			8
		Total	80