Rewarding Learning

General Certificate of Secondary Education
January 2013

Engineering

Paper 1

Assessment Unit 3

assessing

Engineering Technology

[GEE31]

THURSDAY 24 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 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 inclusionin 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.

Answer **all** questions.

				AVAILABLE MARKS
1	**(a)**	Tall double metal cabinet Straight jaw locking pliers (2 × [1])	[2]	
	(b)	Portable scaffolding Picture of a metal fence (2 × [1])	[2]	4
2		Welder Used to mark out 90 degree angles Socket set Used to secure pop rivets Polishing machine Used to create external threads (6 × [1])	[6]	6
3	**(a)**	Match the appropriate term with the correct definition (4 × [1])	[4]	
	(b)	**(i)** Copper	[1]	
		(ii) Mahogany/oak/teak	[1]	
		(iii) Acrylic/polypropylene/PVC	[1]	7
4	**(a)**	Composite materials are formed from two or more materials bonded together	[2]	
	(b)	Mechanical and other properties are improved	[2]	
	(c)	Tufnol – Made from woven linen impregnated with a phenolic resin Tufnol – Used for gears, bearings etc	[1] [1]	
		Carbon Fibre – Made from carbon fibres Carbon Fibre – Used for protective helmets, racing cars	[1] [1]	
		Glass Reinforced Plastic – Made from plastic which has glass fibre strands Glass Reinforced Plastic – Used for boats or car bodies	[1] [1]	
	(d)	Example – Nitinol Properties – Can be easily shaped when cool but returns to remembered shape when heated above a certain temperature	[1] [2]	13

					AVAILABLE MARKS
5	**(a)**	When designing products for manufacture – CAD is used		[2]	
		Ensuring safety when manufacturing a product – Robotics can be used and electronic checks to ensure that guards are in position on machines etc.		[2]	
		Evaluating Product Design – Using digital technologies to ensure that a product functions correctly		[2]	
	(b)	Visualise on screen time frames Production planning can be changed quite easily Lead times are reduced Others considered (2 × [2])		[4]	10
6	**(a)**	**(i)**	Solid Works	[2]	
		(ii)	Gives the manufacturer an idea of what the product is going to look like	[2]	
	(b)	**(i)**	CAM can be used to model prototypes Others considered	[2]	
		(ii)	Products are manufactured very accurately. Others considered	[2]	8
7	Appropriate products stated. Automation examples – Robotic welding, pick and place machines. Others considered (2 × [2])			[4]	
	Benefit to the manufacturer – Lead times reduced, reduced workforce, less waste in materials, can work 24/7. Others considered (2 × [2])			[4]	8
8	**(a)**	Advantage for the consumer – Products are safer to use. Others considered		[1]	
		Advantage for the manufacturer – Products are not returned to the factory. Others considered		[1]	
	(b)	Surface finish. Colour Fixtures and fittings correctly fitted Others considered (2 × [1])		[2]	4

				AVAILABLE MARKS
9	**(a)**	Machine – Lathe Tool – Knurling tool (Knurler not accepted) (2 × [1])	[2]	
	(b)	Aesthetics Used to enhance a person's grip Others considered (2 × [2])	[4]	
	(c)	Guards must be in place on the lathe. Goggles must be worn. Material must be rotating at the correct speed. Others considered (2 × [2])	[4]	10
10	**(a)**	Reduced lead times. Products can be manufactured 24/7 Greater output of products. Staff need to be trained to use the equipment. Others considered	[5]	
	(b)	Less waste of materials Products can be recycled more easily. Manufacturing process is quicker so less energy required Others considered	[5]	10
			Total	**80**