



Rewarding Learning

**General Certificate of Secondary Education
2016**

Engineering

Paper 2

Assessment Unit 3

assessing

Engineering Technology

[GEE32]

MONDAY 6 JUNE, 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.

- 1 (a) (i)** It is lighter than sheet mild steel.
It is easily cleaned.
You can see what is in the trolley from a distance, because of the mesh design.
Rain water will not sit in the base.
All alternative answers will be considered.
(2 × [1]) [2]
- (ii)** Dip coating.
Galvanising
Use a non corrosive alloy, e.g stainless steel.
All alternative answers will be considered.
(2 × [1]) [2]
- (iii)** Welding
A fitted plate/bracket using nuts and bolts.
A riveted fitted plate/bracket.
A fitted plate/bracket using self-tapping screws.
All alternative answers will be considered.
(1 × [1]) [1]
- (b) (i)** Wheel rims.
All alternative answers will be considered.
(1 × [1]) [1]
- (ii)** Wheel: Very accurate process, fast process; speed up lead times;
All alternative answers will be considered.
(1 × [2]) [2]
- (c)** Initial set-up cost would be high [1] and require additional space for manufacturing. [1]
Competitive pricing of the components [1] sourced through a range of suppliers. [1]
Physical size of buildings [1] may not allow for additional manufacturing facilities. [1]
All alternative answers will be considered.
(2 × [2]) [4]
- (d)** Outsource the assembly of the complete wheel including the tyre.
Buy in completed assembly components, e.g. tyre and hub complete with bearings.
Outsource the complete back and front axle assembly.
Outsource all manufacturing and assembly of the product.
All alternative answers will be considered.
(1 × [2]) [2]

AVAILABLE
MARKS

- (e) A high degree of accuracy and tolerance can be achieved compared to the more traditional processes used.
 Material lengths can be cut to a high degree of accuracy compared to the traditional method of measuring marking and cutting out.
 Robotic welding can spot weld a frame accurately and more efficiently and proceed to the next stage of full welding. Using traditional methods would take much longer to weld each frame and require more preparation.
 Robots can fit components together into a jig before moving onto precise welding using accurate temperatures.
 Welding by traditional methods requires a greater reliance on the skill of the welder which may not be consistent.
 Cleaning and preparation of the joints can be automated, this is quicker than traditional methods.
 All alternative answers will be considered.
 (3 × [2]) [6]

- (f) Appropriate notes and sketches outlining how the sides are able to fold down and detach.

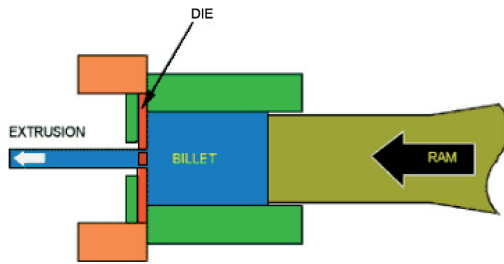


When the CAM lever is lifted the CAM lifts the handle out of the bracket. The sides are secured on using beta pins and hinges which allow them to fold down and detach from the trolley. There is a hinge on the side and on the frame of the trolley. When the two beta clips are removed and the CAM lever is lifted out of the bracket, the sides can be detached.

Marks awarded for

- Detail contained in sketches [4]
 - Quality of sketches [3]
 - Detailed notes [3]
- [10]

(g) Appropriate notes and sketches outline the process of metal extrusion.



The RAM forces the billet through the die to produce the required extruded piece.

The billet can be hot or cold.

Reference to hydraulic RAM.

Billet is held within a casing.

Reference to force (hydraulic).

Reference to the cooling process.

Reference to the shape of the die.

Quality of written communication is assessed in this question.

Marks awarded for:

- Suitability of chosen method [4]
- Quality of sketches [3]
- Detailed notes [3]

[10]

40

Total

40

Response Type	Description	Mark Band
	<ul style="list-style-type: none"> • When a response is not worthy of credit, a [0] should be awarded 	[0]
Limited	<ul style="list-style-type: none"> • A vague description of the metal extrusion process and parts • Sketches are limited/basic lacking communication techniques • The accuracy of spelling, punctuation and grammar is limited 	[1]–[3]
Satisfactory	<ul style="list-style-type: none"> • A good/satisfactory description of the metal extrusion process and parts • Sketches are of a satisfactory standard showing good communication techniques • The accuracy of spelling, punctuation and grammar is satisfactory 	[4]–[6]
Very Good	<ul style="list-style-type: none"> • An excellent detailed description of the metal extrusion process and parts • Sketches are of a high quality showing excellent communication techniques • The accuracy of spelling, punctuation and grammar is very good 	[7]–[10]