



Rewarding Learning

**General Certificate of Secondary Education
2019**

Engineering and Manufacturing

Unit 2
assessing
Production

**[GEM21]
WEDNESDAY 8 MAY, MORNING**

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 and Manufacturing.

Candidates must:

- AO1** Recall, select and communicate their knowledge and understanding of engineering and manufacturing in a range of contexts;
- AO2** Apply skills, knowledge and understanding, including quality standards in a variety of design contexts. Plan and carry out investigations and making tasks involving an appropriate range of tools, equipment, materials and processes; and
- AO3** Analyse and evaluate evidence, design proposals and outcomes, make reasoned judgements and present conclusions and recommendations.

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.

Types 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.

Mild Steel Part – Threaded bar

**AVAILABLE
MARKS**

1 Threaded bar

- (i) Measure the length of the threaded portion**
 If within a tolerance of +/- 0.5mm [4]
 If within a tolerance of +/- 1.5mm [3]
 If within a tolerance of +/- 2.5mm [2]
 If outside a tolerance of +/- 2.5mm [1]
 If the thread is not present [0]
 (1 × [4]) [4]

- (ii) Inspect the thread on the bar checking straightness and surface finish of the thread**
 If there is a high quality parallel thread. [3]
 If there is a poor quality parallel thread. [2]
 If there is an irregular thread. [1]
 If the thread is not present. [0]
 (1 × [3]) [3]

- (iii) Overall length of the threaded bar**
 Threaded bar 40mm long within a tolerance of +/- 0.5mm [3]
 Threaded bar 40mm long within a tolerance of +/- 1mm [2]
 Threaded bar 40mm long within a tolerance of +/- 1.5mm [1]
 If outside tolerance of +/- 1.5mm [0]
 (1 × [3]) [3]

- (iv) Satisfactory quality of finish on the threaded bar [2]**
 Poor quality of finish on the threaded bar [1]
 Threaded bar unfinished [0]
 (1 × [2]) [2]

12

Mild Steel Part – Drilled plate

2 M5 × 0.8 threaded hole in drilled plate

- (i) Threaded hole correctly located within a tolerance of +/- 0.5mm [2]**
 If within a tolerance of +/- 1.5mm [1]
 If outside a tolerance of +/- 1.5mm [0]
 (1 × [2]) [2]

- (ii) Assess the fit of the threaded bar when fitted to the threaded hole**
 Threaded bar fits closely in the hole [2]
 Threaded bar loose /tight fit in the hole [1]
 Threads do not engage [0]
 (1 × [2]) [2]

- (iii) Assess the squareness of the threaded bar when fitted to the threaded hole**
 Threaded bar less than 2° out of square [2]
 Threaded bar more than 2° out of square [1]
 Threads do not engage [0]
 (1 × [2]) [2]

6

			AVAILABLE MARKS
3	7 mm Holes		
	(i) Hole diameters 7 mm [1] Hole diameters incorrect [0] (1 × [1])	[1]	
	(ii) 2 off 7 mm holes correctly located within a tolerance of +/- 0.5 mm (2 × [2]) 2 off 7 mm holes correctly located within a tolerance of +/- 1.5 mm (2 × [1]) If outside tolerance of +/- 1.5 mm [0] (2 × [2])	[4]	5
4	4 mm Holes		
	(i) Hole diameters 4 mm [1] Hole diameters incorrect [0] (1 × [1])	[1]	
	(ii) 4 off 4 mm holes correctly located within a tolerance of +/- 0.5 mm (4 × [2]) 4 mm holes correctly located within a tolerance of +/- 1.5 mm (4 × [1]) If outside tolerance of +/- 1.5 mm. [0] (4 × [2])	[8]	9
5	Radius		
	12.5 mm radius completed to a high degree of precision [3] 12.5 mm radius completed to a satisfactory degree of precision [2] 12.5 mm radius completed to a limited degree of precision [1] Radius less than 50% complete [0] (1 × [3])	[3]	3
6	Overall Length of drilled plate (100 mm)		
	Drilled plate 100 mm long within a tolerance of +/- 0.5 mm [3] Drilled plate 100 mm long within a tolerance of +/- 1 mm [2] Drilled plate 100 mm long within a tolerance of +/- 1.5 mm [1] If outside tolerance of +/- 1.5 mm. [0] (1 × [3])	[3]	3
7	Quality of finish		
	(i) Satisfactory quality of finish on the drilled plate edges [2] Poor quality of finish on the drilled plate edges [1] Edges unfinished [0] (1 × [2])	[2]	
	(ii) Satisfactory quality of finish on the drilled plate faces [2] Poor quality of finish on the drilled plate faces [1] Faces unfinished [0] (1 × [2])	[2]	4

Acrylic Part

8 Top cut out, length of part measured at 15mm each side of the part centreline (100mm dimension)

If within a tolerance of ± 0.5 mm (2 × [2])

If within a tolerance of ± 1.5 mm (2 × [1])

If outside a tolerance of ± 1.5 mm [0]

(2 × [2])

[4]

4

9 Wing profiles – Accuracy of the 15mm radii

15mm radii completed to a high degree of precision (2 × [3])

15mm radii completed to a satisfactory degree of precision (2 × [2])

15mm radii completed to a poor degree of precision (2 × [1])

15mm radii not present [0]

(2 × [3])

[6]

6

10 Bent part – Height of the parallel portion of the sides (16mm)

If within a tolerance of ± 0.5 mm at the mid point of the parallel section (2 × [3])

If within a tolerance of ± 1 mm at the mid point of the parallel section (2 × [2])

If within a tolerance of ± 2 mm at the mid point of the parallel section (2 × [1])

Outside a tolerance of ± 2 mm at the mid point of the parallel section [0]

(2 × [3])

[6]

6

11 10mm radii – Accuracy of each 10mm radius

10mm radii completed to a high degree of precision (2 × [2])

10mm radii completed to a satisfactory degree of precision (2 × [1])

Radius incomplete [0]

(2 × [2])

[4]

4

12 Bends

(i) Bent to the correct width (46mm), measured at each end of the part

Part width within a tolerance of ± 0.5 mm (2 × [4])

Part width within a tolerance of ± 1.5 mm (2 × [3])

Part width within a tolerance of ± 2.5 mm (2 × [2])

Part width within a tolerance of ± 3.5 mm (2 × [1])

Body width outside a tolerance of ± 3.5 mm [0]

(2 × [4])

[8]

(ii) Sides bent square to the base

Side square to the base within 1 degree (2 × [3])

Side square to the base within 2 degrees (2 × [2])

Side square to the base within 3 degrees (2 × [1])

Side outside a tolerance of 2 degrees [0]

(2 × [3])

[6]

14

13 Quality of finish on edges of acrylic part

Wet and dry paper finish on all of the acrylic part edges [4]
Wet and dry paper finish on more than 75% of the acrylic part edges [3]
Good quality finish with some tool marks on the acrylic part edges [2]
Poor quality finish some saw and cross filing marks on the edges [1]
Rough and unfinished on most of the edges [0]
(1 × [4])

[4]

AVAILABLE
MARKS

4

14 Location of the 6mm holes in relation to the 7mm hole in the base of the bracket

7mm hole

(i) Hole diameter 7 mm [1]

Hole diameter incorrect. [0]
(1 × [1])

[1]

3 off 6 mm holes

Hole diameters 6mm. [1]
Hole diameters incorrect. [0]
(1 × [1])

[1]

(ii) Position of the 6mm holes on the wings of the acrylic part

If within a tolerance of +/- 1 mm (2 × [5])
If within a tolerance of +/- 2mm (2 × [4])
If within a tolerance of +/- 3mm (2 × [3])
If within a tolerance of +/- 4mm (2 × [2])
If within a tolerance of +/- 5mm (2 × [1])
If outside tolerance a +/- 5 mm [0]
(2 × [5])

[10]

(iii) Distance between the 7mm hole and the 6mm holes in the bracket wings

If within a tolerance of +/- 1 mm (2 × [4])
If within a tolerance of +/- 2mm (2 × [3])
If within a tolerance of +/- 3mm (2 × [2])
If within a tolerance of +/- 4mm (2 × [1])
If outside of tolerance by +/- 4 mm. [0]
(2 × [4])

[8]

20

Total

100