SMARTWIZ

GRADE10 ENGINEERING GRAPHICS AND DESIGN (EGD) EXAM

MARKS: 100

MARKS	

TIME: 2 hours

SCHOOL _____

CLASS (e.g. 4A) _____

SURNAME _____

NAME _____

Instructions for Learners:

- Read all the instructions carefully before you begin the exam.
- Write your name and learner number clearly on the answer sheet/booklet.
- Answer all the questions unless otherwise instructed.
- Show all your work/calculations where applicable.
- Write neatly and legibly.
- Use only blue or black ink. *Do not use correction fluid or tape.*
- No electronic devices (calculators, phones, etc.) are allowed unless explicitly permitted.
- Raise your hand if you have any questions.
- Do not talk to other learners during the exam.
- Any form of cheating will lead to disqualification.

This test consists of 6 pages including the cover page.

📝 SECTION A: GRAPHIC DRAWINGS & TECHNICAL SKILLS (40 MARKS)

QUESTION 1: SECTIONAL VIEW DRAWING (15 marks)

The following diagram (teacher to insert) shows the front and top views of a hollow rectangular object.

☐ **TASK:** Draw the **front view in full section** using first-angle orthographic projection.

Drawing area:

```
+-----------------------------------------------------------+
|                                                           |
|                                                           |
|                                                           |
|                                                           |
|                                                           |
|                                                           |
|                                                           |
+-----------------------------------------------------------+
```

QUESTION 2: FREEHAND ISOMETRIC SKETCH (10 marks)

Sketch a **freehand isometric view** of a T-shaped bracket that has:

- A vertical flange
- A horizontal base
- A circular hole in the center

Sketch area:

```
+-----------------------------------------------------------+
|                                                           |
|                                                           |
|                                                           |
|                                                           |
|                                                           |
|                                                           |
|                                                           |
+-----------------------------------------------------------+
```

QUESTION 3: INTERPRETING TECHNICAL DRAWINGS (15 marks)

Use the given drawing to answer the following:

3.1 What type of projection is used?

3.2 Name two conventions used in this drawing:

1.
2.

3.3 Identify three visible components:

1.
2.
3.

3.4 What is the purpose of the cylindrical hole in the base?

3.5 Calculate the total height if the base is 10 mm, the bracket is 60 mm, and the top is 15 mm:

3.6 Suggest a material suitable for this component and explain why:

💡 SECTION B: DESIGN PRINCIPLES & SYMBOLS (30 MARKS)

QUESTION 4: DESIGN TASK (15 marks)

Design a **folding metal step stool** for home use.

4.1 Suggest a material and explain why it's suitable:
Material: _____
Reason: _____

4.2 List two design factors to consider:

1. _____
2. _____

4.3 Sketch the front view of your stool below (include two steps and foldable legs):

4.4 Suggest a finishing process to prevent rust:

4.5 How would you test the safety of your design?

QUESTION 5: SYMBOLS AND CONVENTIONS (15 marks)

Match the symbol to its meaning:

Symbol	Meaning	Your Answer
⌀	A. Diameter	_____

R10	B. Radius	_____
M10	C. Thread size	_____
⊥	E. Perpendicular	_____

5.6 Draw the symbol for a square butt weld below:

```
+-----------------------------------------------------------+
|                                                           |
|                                                           |
|                                                           |
+-----------------------------------------------------------+
```

5.7 Why is line thickness important in technical drawings?

🔧 SECTION C: MECHANICAL COMPONENTS & SAFETY (30 MARKS)

QUESTION 6: MECHANICAL COMPONENTS (15 marks)

6.1 Name the following based on the diagram (teacher inserts bolt assembly):
a) Locking device: _____
b) Component that prevents rotation: _____
c) Load distribution element: _____

6.2 Difference between bolt and screw:

6.3 Give one use for:
Cotter pin – _____
Washer – _____

6.4 Label four parts of a nut and bolt from the diagram:

1. _____
2. _____
3. _____
4. _____

6.5 What is a risk of over-tightening bolts?

QUESTION 7: SAFETY AND EQUIPMENT CARE (15 marks)

7.1 List three EGD classroom safety rules:

1. _____
2. _____
3. _____

7.2 Why should drawing instruments be stored properly?

_____

_____

7.3 State one reason for each of the following:
a) Using a sharp pencil – _____
b) Not bending the compass – _____
c) Clean hands while drawing – _____

7.4 How do you clean dirty drawing tools?

_____

_____

7.5 Name three items of PPE used in a workshop:

1. _____
2. _____
3. _____

END OF EXAM

TOTAL : 100

MEMO

📝 SECTION A: GRAPHIC DRAWINGS & TECHNICAL SKILLS (40 MARKS)

QUESTION 1: SECTIONAL VIEW DRAWING (15 marks)

- Correct front sectional layout: 5
- Internal features shown accurately: 3
- Appropriate hatching used: 3
- Line types (solid, hidden, cutting plane) used correctly: 2
- Neatness and scale: 2

QUESTION 2: FREEHAND ISOMETRIC SKETCH (10 marks)

- Correct isometric layout (30° angles): 3
- Bracket shape with hole shown: 3
- Proportional dimensions: 2
- Neat and clear lines: 2

QUESTION 3: INTERPRETATION OF TECHNICAL DRAWINGS (15 marks)

3.1 **First-angle orthographic projection** (2)
3.2 Any two conventions (1 each):

- Centre lines
- Hidden detail
- Cutting plane
- Dimension line (2)
  3.3 Any three visible components (1 each):
- Bracket, bolt, nut, shaft, plate (3)
  3.4 Cylindrical hole purpose: **Fitting/fastening/alignment** (2)
  3.5 Total height: 10 mm + 60 mm + 15 mm = **85 mm** (2)
  3.6 Material: **Mild steel / aluminium** (1)
  Reason: Durable, corrosion-resistant, easy to machine (1)

💡 SECTION B: DESIGN PRINCIPLES & SYMBOLS (30 MARKS)

QUESTION 4: DESIGN TASK (15 marks)

4.1 Material: Aluminium / mild steel / stainless steel (1)
Reason: Strong, corrosion-resistant, lightweight (1)
4.2 Design factors:

- Stability, safety, weight, cost (any 2 × 1) (2)
  4.3 Sketch of stool:
- Two steps shown: 2
- Foldable frame: 2
- Proportions and clarity: 1
- Neatness: 1
  4.4 Finishing process: Paint / galvanising / powder coating (1)
  4.5 Safety test:
- Apply load
- Check for balance
- Inspect joints
- Evaluate folding mechanism
  (Any valid 4-step method = 4)

QUESTION 5: SYMBOLS AND CONVENTIONS (15 marks)

Matching:
5.1 – ⌀ → **A. Diameter**
5.2 – R10 → **B. Radius**
5.3 – M10 → **C. Thread size**
5.4 – || → **D. Parallel**
5.5 – ⊥ → **E. Perpendicular**
(5 × 1 = 5)

5.6 Square butt weld:

- Reference line and arrow: 1
- Square weld symbol: 2
- Correct placement and label: 2
  (Total = 5)

5.7 Purpose of line weight:

- Differentiate between visible, hidden, sectional details

- Improve clarity/readability
  (Any 3 valid points = 3)

🔧 SECTION C: MECHANICAL COMPONENTS & SAFETY (30 MARKS)

QUESTION 6: MECHANICAL COMPONENTS (15 marks)

6.1 a) Lock nut / split pin (1)
b) Key or dowel pin (1)
c) Washer or support ring (1)
6.2 Bolt goes with nut; screw threads into material (2)
6.3 Cotter pin: Prevents parts loosening (1)
Washer: Distributes load / protects surfaces (1)
6.4 Labels (any four):

- Head, shank, thread, nut, washer (4)
  6.5 Risk:
- Stripped threads
- Cracked parts
- Damaged materials (any 2 = 2)

QUESTION 7: SAFETY AND EQUIPMENT CARE (15 marks)

7.1 Any 3 valid safety rules (3 × 1):

- No food/drink
- No running
- Handle tools carefully
- Keep tools sharp and clean (3)
  7.2 Stored properly to prevent warping/breaking (2)
  7.3
  a) Accurate lines (1)
  b) Prevents tool damage (1)
  c) Avoids smudging (1)
  7.4 Use alcohol/soft cloth to clean (2)
  7.5 PPE (any 3 × 1):
- Safety glasses, gloves, apron, safety boots, earplugs (3)

TOTAL: 100 MARKS ✅