SMARTWIZ

GRADE10 ENGINEERING GRAPHICS AND DESIGN (EGD) EXAM

MARKS: 100

MARKS	

TIME: 2 hours

SCHOOL _____

CLASS (e.g. 4A) _____

SURNAME _____

NAME _____

Instructions for Learners:

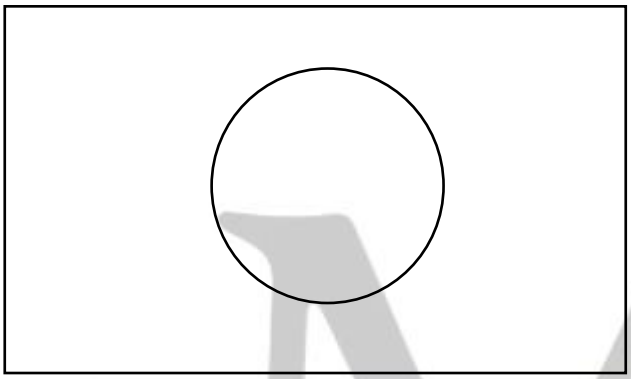
- Read all the instructions carefully before you begin the exam.
- Write your name and learner number clearly on the answer sheet/booklet.
- Answer all the questions unless otherwise instructed.
- Show all your work/calculations where applicable.
- Write neatly and legibly.
- Use only blue or black ink. *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 DRAWING (15 marks)

You are given the **front view** and **top view** of a block with an internal cylindrical hole. Draw the **front view in full section**.



Drawing Area:

Marking criteria:

- Accurate use of hatching for sectional view (4)
- Correct shape and features shown (5)
- Correct projection from top view (3)

- Line types and neatness (3)

QUESTION 2: FREEHAND SKETCHING (ISOMETRIC) (10 marks)

Sketch a **freehand isometric** drawing of a **tapped L-bracket** with one hole and one vertical flange.

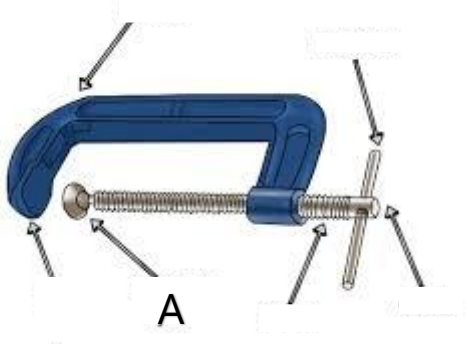
Sketch Space:

Marking:

- Correct isometric form and angle (3)
- Proportion and dimensions (3)
- Flange and hole placement (2)
- Overall presentation (2)

QUESTION 3: INTERPRETATION OF TECHNICAL DRAWINGS (15 marks)

Use the provided drawing of a **mechanical part** to answer:



3.1 What type of projection is used in the drawing?

_____

3.2 Identify two drawing conventions used:

_____

3.3 Name three components visible in the drawing:

1. _____
2. _____
3. _____

3.4 What is the function of the hole marked A?

_____

3.5 Calculate the total width if each side is 20 mm and the center piece is 50 mm.

_____

3.6 What material is suitable for this part and why?

_____

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

QUESTION 4: INTERPRETING DESIGN SCENARIOS (15 marks)

You are designing a **metal step stool** for industrial use.

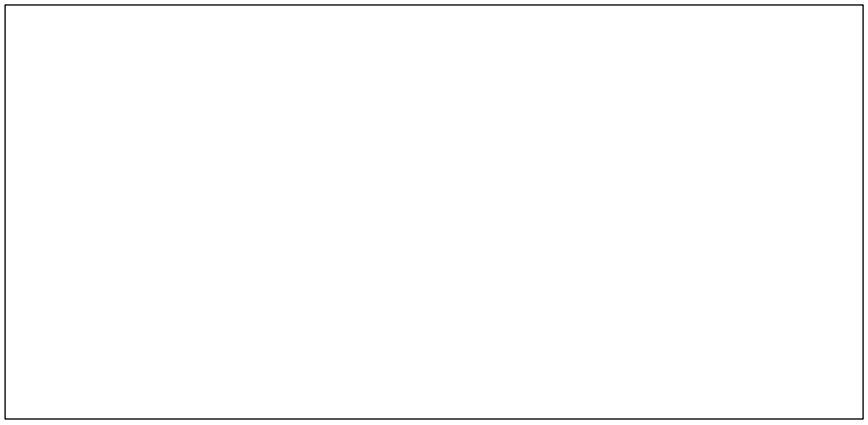
4.1 State a suitable material and give a reason.

_____

4.2 Identify **two design factors** that must be considered.

_____

4.3 Draw a **freehand front view** of your step stool with two steps and a support frame. (6)



4.4 Suggest a suitable **finish** to protect the metal from rust. (1)

_____

4.5 Briefly describe how you would **test** the stool for safety. (4)

_____

QUESTION 5: SYMBOLS AND CONVENTIONS (15 marks)

Match the **technical symbols** with their correct meanings:

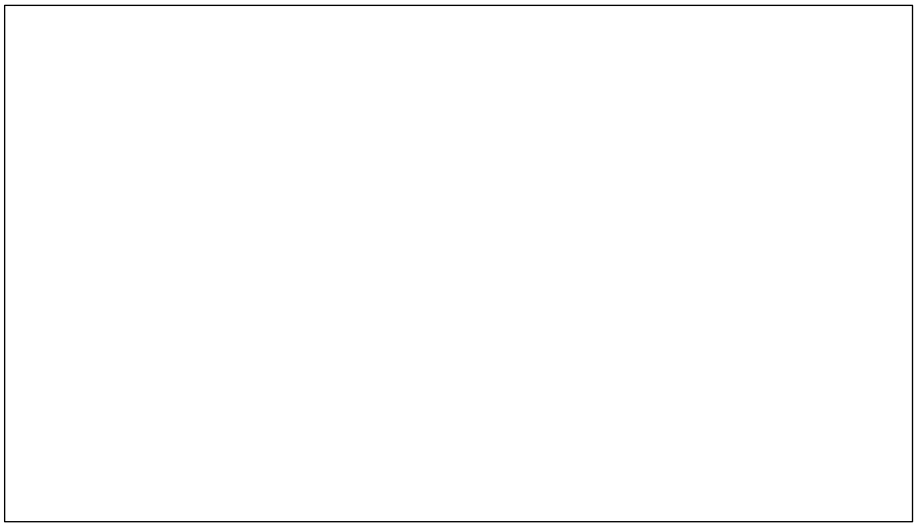
Symbols:

A. ⊥
B. ⌀
C. M10
D. R10
E. ||

Symbol	Meaning
5.1 ___	Diameter
5.2 ___	Radius
5.3 ___	Thread size
5.4 ___	Parallel
5.5 ___	Perpendicular

(1 mark each)

5.6 Draw and label the **welding symbol** for a square butt weld. (5)



5.7 Explain the purpose of **line weight (thickness)** in technical drawings. (3)

_____

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

QUESTION 6: MECHANICAL ASSEMBLIES (15 marks)

6.1 Name the following components based on the drawing:
a) _____

b) _____

c) _____

6.2 Explain the difference between a **bolt** and a **screw**. (2)

_____

6.3 State one use for each:

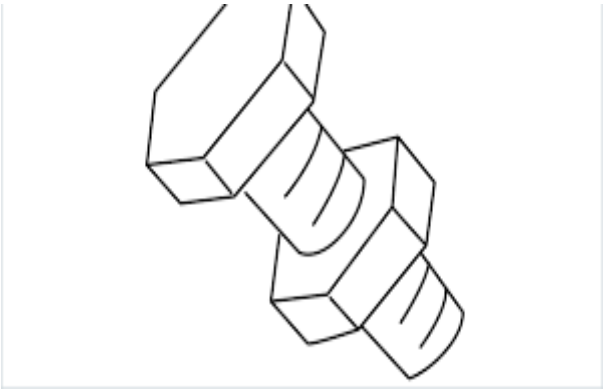
Cotter pin: _____

-

Washer: _____

-

6.4 Label the parts of a **nut and bolt assembly** in the figure provided:



(4 × 1 = 4)

6.5 What happens if a bolt is over-tightened? (2)

_____

QUESTION 7: SAFETY & CARE OF EQUIPMENT (15 marks)

7.1 Give 3 safety rules in the EGD drawing room. (3)

_____

7.2 Why must you store your set square properly? (2)

_____

7.3 Give one reason for each of the following:
a) Using a sharp pencil – _____
b) Not bending your compass – _____
c) Keeping hands clean when using paper – _____

7.4 Describe how to clean a dirty drawing instrument. (2)

_____

7.5 What PPE (Personal Protective Equipment) is needed in an engineering workshop? Name 3 items. (3)

_____

End of Paper ✅

TOTAL : 100

MEMO

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

QUESTION 1: SECTIONAL DRAWING (15 marks)

- Correct front sectional view layout: 5
- Accurate hatching of the sectional area: 3
- Projection and alignment between views: 3
- Line work, types, and conventions used correctly: 2
- Overall neatness and clarity: 2

QUESTION 2: FREEHAND ISOMETRIC SKETCH (10 marks)

- Accurate isometric projection (30°): 3
- Proportions and feature sizes: 3
- Flange, hole, and L-bracket shape shown: 2
- Overall neatness and clarity: 2

QUESTION 3: INTERPRETATION OF TECHNICAL DRAWINGS (15 marks)

3.1 **First-angle orthographic projection** (2)

3.2 Drawing conventions (any 2):

- Centre lines
- Hidden detail
- Cutting plane
- Dimensioning conventions (2)

3.3 Any 3 identifiable components (e.g. flange, base plate, threaded hole, bolt): (3)

3.4 Hole marked A: **Used for a bolt, screw, or pin to join or align parts** (2)

3.5 Width: 20 mm + 50 mm + 20 mm = **90 mm** (2)

3.6 Suitable material:
Example: **Mild steel or aluminium**
Reason: Strong, durable, corrosion-resistant (2)

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

QUESTION 4: INTERPRETING DESIGN SCENARIOS (15 marks)

4.1 Material: e.g., Aluminium / Mild Steel (1)
Reason: Strong and corrosion-resistant (1)

4.2 Design factors (any two):

- Stability
- Load capacity
- Ease of manufacturing
- Portability (2)

4.3 Step stool sketch:

- Frame shown: 2
- Two steps shown: 2
- Proportion and clarity: 1
- Neatness: 1

4.4 Finish: e.g., Powder coating / Galvanising / Paint (1)

4.5 Testing method (any valid method):
e.g., Apply weight, test on different surfaces, ensure no slipping, check welds (4)

QUESTION 5: SYMBOLS AND CONVENTIONS (15 marks)

5.1 Diameter – **B**
5.2 Radius – **D**
5.3 Thread size – **C**
5.4 Parallel – **E**
5.5 Perpendicular – **A**
(5 × 1 = 5)

5.6 Square butt weld symbol:

- Correct reference line and arrow: 1
- Square butt symbol drawn correctly: 2

- Placement and label accuracy: 2
  (Total = 5)

5.7 Importance of line weight:

- Differentiate features (e.g., visible, hidden, cutting)
- Clarify drawing parts and improve legibility (3)

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

QUESTION 6: MECHANICAL ASSEMBLIES (15 marks)

6.1
a) Locking fastener: **Lock nut / split pin** (1)
b) Used to align: **Dowel pin / locating pin** (1)
c) Shaft support: **Bearing** (1)

6.2 Bolt goes with nut, screw threads into material (2)

6.3

- Cotter pin: Prevents parts from loosening (1)
- Washer: Distributes pressure / protects surface (1)

6.4 Bolt assembly labels (any four):

- Bolt head
- Shaft
- Washer
- Nut
  (4 × 1 = 4)

6.5 Over-tightening:

- Stripped threads
- Part deformation
  (Any 2 = 2)

QUESTION 7: SAFETY & CARE OF EQUIPMENT (15 marks)

7.1 Any 3 safety rules:

- No running
- Sharp tools used safely
- Use proper posture
- Keep drawing area clean
  (3 × 1 = 3)

7.2 Stored properly to prevent breaking or warping (2)

7.3
a) Sharp pencil: For accurate, clean lines (1)
b) Don't bend compass: Maintains drawing accuracy (1)
c) Clean hands: Prevent smudges, preserve paper (1)

7.4 Use soft cloth or alcohol-based cleaner (2)

7.5 PPE items:
Any 3: Goggles, gloves, apron, steel-toe boots, ear protection (3)

✅ **TOTAL MARKS: 100**