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.

DATE OF A THEFT AND IN THE

- 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.

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SECTION A: DRAWING TECHNIQUES (30 marks)

QUESTION 1: ORTHOGRAPHIC PROJECTION (10 marks)

Draw the **front**, **top**, and **right-side views** of the object shown in the 3D figure (teacher inserts sketch here). Use **first-angle projection**. Include:

- Dimensioning
- Hidden detail
- A cutting plane for sectional view

Noving anges	
Prawing space:	
QUESTION 2: ISOMETRIC DRAW	VING (10 marks)
CESTION 2. ISOMETRIC DRIVE	VIVO (IV marks)
Draw the isometric view of the same object	t shown above. Use the standard 30° angle for axes.

ketch freehand : • a) A mechanical p	eart (e.g., a hook or clamp) cal component (e.g., a plug)
	nd indicate possible materials.
reehand Sketch A:	

eehand Sketch B:	
SECTION B: DESIGN AND COMMUNICATION (40 manual desired of the second of	rks)
In a CAD program (e.g., AutoCAD, SketchUp, TinkerCAD), create a 2D drawing of the object Question 1. Include:	given
 Views (Front, Top, Side) Dimensions Title block Submit printed copy or screenshots with labels. 	

Describe the steps you would follow to turn the 2D CAD drawing into a 3D model:
QUESTION 5: DESIGN PROCESS (20 marks)
1 Name and explain the 6 steps of the design process:
1.
2. ————————————————————————————————————
4. ————————————————————————————————————
5
.2 Why is each step important in engineering design?
.2 why is each step important in engineering design.
MINSTERATER WORKS
.3 Choose any product (e.g., bicycle, desk, lamp). Explain how the design process was used in its reation:
SECTION C: MATERIALS AND MANUFACTURING (30 narks)
QUESTION 6: MATERIAL PROPERTIES (15 marks)
DUESTION 6: MATERIAL PROPERTIES (15 marks) 1 List 3 common engineering materials and describe their properties. Material: roperties:

c) Material: Properties:
6.2 Give one example of where each material is used in real-world engineering: a) b) c)
QUESTION 7: MANUFACTURING PROCESSES (15 marks)
7.1 Describe the following processes and where they are used:
a) Casting:
b) Machining:
c) Welding:
7.2 State one advantage and one disadvantage of each:
Casting:
Advantage: Disadvantage:
Machining: Advantage:
Advantage: Disadvantage:
Welding:
Advantage:
Disadvantage:

End of Paper <

TOTAL:

MEMO

QUESTION 1: ORTHOGRAPHIC PROJECTION (10 marks)

Mark allocation:

• Correct layout in first-angle projection: 2 marks

Front view: 2 marksTop view: 2 marks

• Right-side view: 2 marks

Hidden detail and line types: 1 mark

• Cutting plane and sectional conventions: 1 mark

All views must align correctly and be dimensioned neatly with visible construction lines.

QUESTION 2: ISOMETRIC DRAWING (10 marks)

Mark allocation:

- Correct use of 30° angles: 2 marks
- Accuracy of lengths and proportions: 3 marks
- Visible edges and lines correctly drawn: 3 marks
- Neatness and line quality: 2 marks

☑ Drawing must be correctly scaled and show an accurate 3D representation.

QUESTION 3: FREEHAND SKETCHING (10 marks)

Mark allocation:

• Sketch A (mechanical part): 2 marks

• Sketch B (electrical component): 2 marks

• Labels for both sketches: 2 marks

• Appropriate materials indicated: 2 marks

• Overall neatness: 2 marks



SECTION B: DESIGN AND COMMUNICATION (40 marks)

QUESTION 4: CAD APPLICATION (20 marks)

4.1 CAD Drawing (only applicable if submitted):

- Accurate views: 6 marks
- Proper dimensions: 4 marks
- Title block correctly completed: 2 marks

4.2 Description of steps to 3D model:

- Mentioning software selection: 1 mark
- Creating base shapes (extrude/revolve): 2 marks
- Using features (chamfer, fillet, hole): 2 marks
- Saving/exporting model: 1 mark

QUESTION 5: DESIGN PROCESS (20 marks)

5.1 Six Steps:

- 1. Identify the problem -1 mark
- 2. Investigate − 1 mark
- 3. Generate ideas 1 mark
- 4. Develop solution − 1 mark
- 5. Make/model 1 mark
- 6. Evaluate 1 mark

5.2 Importance (any 3 points):

- Ensures planning
- Avoids design flaws
- Promotes creativity
- Helps meet client needs $(3 \times 1 = 3 \text{ marks})$

5.3 Application to a real product (logical steps explained):

• 4 points (e.g., problem identification, sketching, prototyping, evaluating) – 4 marks

SECTION C: MATERIALS AND MANUFACTURING (30 marks)

QUESTION 6: MATERIAL PROPERTIES (15 marks)

6.1 Properties (3 materials):

- a) Steel strong, durable, rust-prone
- b) Aluminium lightweight, corrosion-resistant
- c) Plastic flexible, non-conductive
- $(3 \times 2 = 6 \text{ marks})$

6.2 Applications:

- a) Steel structural beams
- b) Aluminium aircraft bodies
- c) Plastic insulation in wires
- $(3 \times 1 = 3 \text{ marks})$

QUESTION 7: MANUFACTURING PROCESSES (15 marks)

7.1 Definitions (3 marks each):

- Casting: Pouring molten metal into a mould used for engine blocks, metal tools
- **Machining**: Cutting away material used for precise parts
- Welding: Joining metals using heat used in automotive and structural fabrication $(3 \times 3 = 9 \text{ marks})$

7.2 Advantages/Disadvantages:

Casting:

- Adv: Good for complex shapes (1 mark)
- Disady: Can cause defects like porosity (1 mark)

Machining:

- Adv: High accuracy (1 mark)
- Disady: Produces waste (1 mark)

Welding:

- Adv: Strong joints (1 mark)
- Disadv: Requires skilled labour (1 mark)

(6 marks)

TOTAL: 100 MARKS