Mechanical Drawing 2
5145

GENERAL CERTIFICATE OF EDUCATION BOARD

Technical and Vocational Education Examination

JUNE 2025 **INTERMEDIATE LEVEL**

Specialty Name and Acronym	**Manufacturing Mechanics – MAME, Automobile Repair Mechanics – ARM**
Subject Title	**Mechanical Drawing**
Subject Code No.	**5145**
Paper No.	**2**

Duration: Three Hours

Question Booklet

INSTRUCTIONS TO CANDIDATES

- This paper has TWO (2) Sections:

  - **SECTION A – Technological Study** (20 marks)
    Answer **5 out of 7** Questions.
    All the Questions Carry Equal Marks

  - **SECTION B – Graphical Study** (30 marks)
    Answer ALL the questions

- Answer questions in the Answer Booklet.
- The answer booklet is to be handed to the examiner at the end of the paper filled or not.
- This paper is rated at 60% of the entire paper.
- Calculators are allowed.

In calculations, you are advised to show all the steps in your working, giving your answer at each stage.

You are reminded of the necessity of good English and orderly presentation in your answers.

THEME: BENCH GRINDING MACHINE

I- SETTING-UP

The drawing assembly on the **Appendix 1/2** represents a Bench grinding machine used in the manufacturing workshops. Its functions are to execute Machine Finishing Process on work pieces and sharpen machine tools in order to obtained good Finished Surfaces.

II- DESCRIPTION AND FUNCTIONING

The machine body 1 is made of cast iron which carries all the parts of the machine. The power is transmitted through part 3 to part 2 and the grinding wheel is mounted on part 2 with the help of part 19, 16, 17, and 18.

SECTION A

TECHNOLOGICAL STUDY (20 marks)

QUESTION 1: IDENTIFICATION AND FUNCTION OF THE PARTS. (4 marks)

1.1 Name the following parts: 19, 3, 6 and 4. **(0.5 × 4 =2 marks)**

1.2 Give the function of the following parts: 19, 3, 6 and 4. **(0.5 × 4 =2 marks)**

QUESTION 2: KNOWLEDGE OF MATERIALS /4 marks

2.1 In which family of material do the following parts 1, 2 and 20 belong? **(0.5 × 2=1 mark)**

2.2 The shaft 2 is made from **40Cr Ni Mo 6 - 12**. Decode this designation. **(3 marks)**

QUESTION 3: LINKAGES /4 marks

3.1 From the knowledge of linkage, identify the type of link between parts 2 and 3; 2 and 1; **(0.75×2=1.5 marks)**

3.2 Give three characteristics of the link between parts 2 and 3. **(0.5×3=1.5 marks)**

3.3 Indicate the number of degree of freedom permitted by each link: 2 and 3; 2 and 1. **(0.5×2=1 mark)**

QUESTION 4: DESIGNATION OF FASTENERS (4 marks)

4.1 Give the standard designation of the following parts: 19 and 8. **(1.5 × 2=3 marks)**

4.2 Give the name of the assembling element used to assemble the machine on the bench. **(1 mark)**

QUESTION 5: LUBRICATION AND SEALING (4 marks)

5.1 Propose the type of lubrication used in this mechanism. **(2 marks)**

5.2 Justify your answer. **(2 marks)**

QUESTION 6: TOLERANCE AND FIT (4 marks)

On the drawing assembly, the fit between the shaft 2 and the bushing 20 is: **Ø35 H7g6.**
Given that **Ø35 H7=** $\emptyset 35_{0}^{+25}$ and **Ø20 g6=** $\emptyset 20_{-25}^{-9}$,

6.1 Determine the minimum and maximum allowance. **(1.5×2= 3 marks)**

6.2 Deduce the type of fit. **(1 mark)**

QUESTION 7: FUNCTIONAL DIMENSIONING. (4 marks)

7.1 Plot the minimal chain of dimensions related to the clearance **b** as shown in **figure 1** in the answer booklet. **(3 marks)**

7.2 Write down the equations that permit to determine the maximum and minimum (b_3Max and b_3Mini) dimensions of part 3. **(1 mark)**

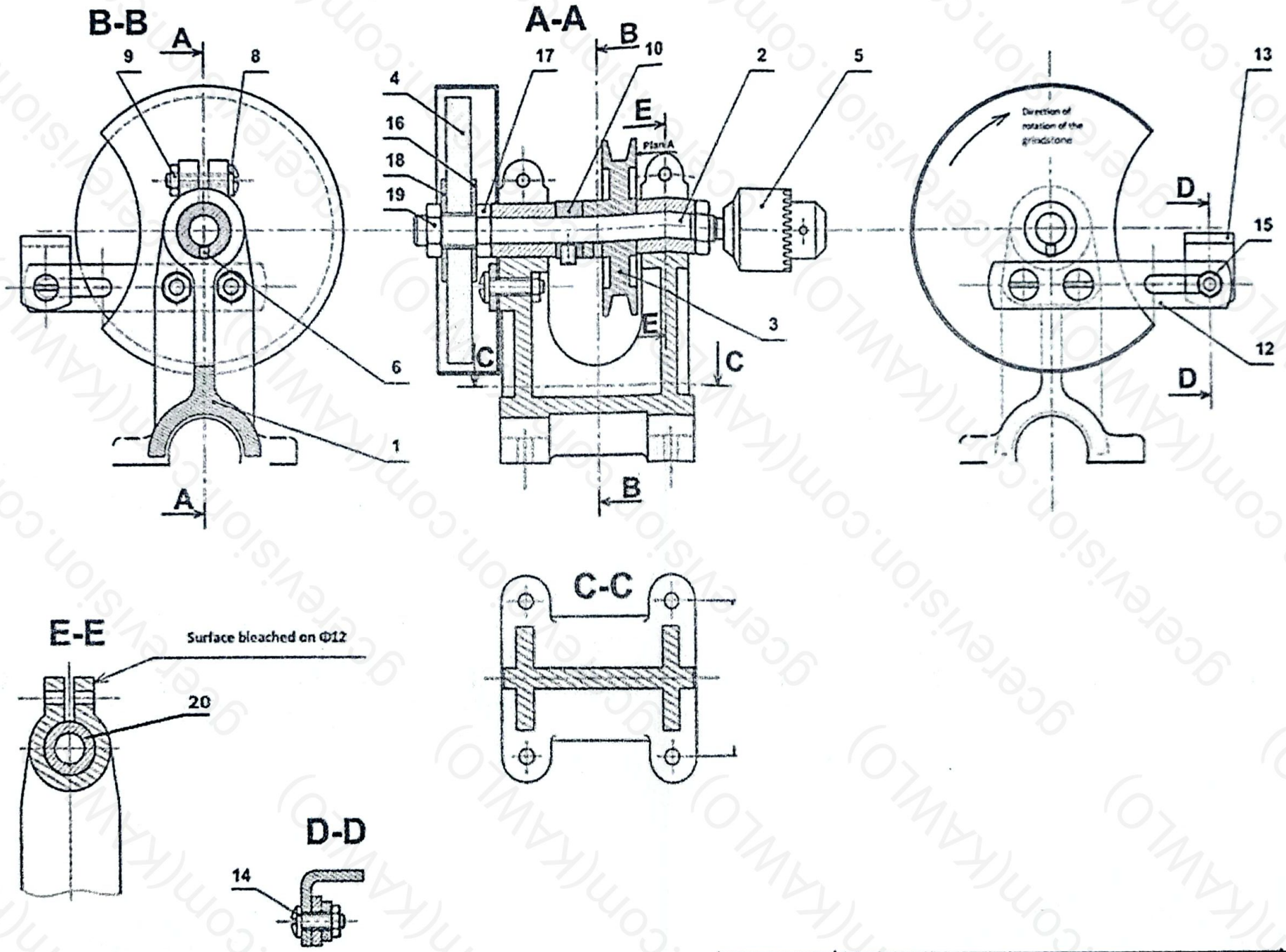
SECTION B

GRAPHICAL STUDY (30 marks)

Complete the detail drawing of the body 1 on **A3H** pre-printed paper (**Appendix 2/2**) in scale **1:1** in:

- Front view section A-A; **(10 marks)**
- Top view C-C; **(10 marks)**
- Left side view B-B. **(10 marks)**

Appendix 1 : Assembly drawing of the bench grinding machine



	BENCH GRINGING	A3H	Duration: 3H
20... Session	ITVE - MAME and ARM		scale: 1:1

REGISTRATION CENTRE NUMBER	CENTRE NAME	
CANDIDATE'S FULL NAMES		
CANDIDATE IDENTIFICATION NUMBER	SUBJECT CODE **5145**	PAPER NUMBER **2**
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GENERAL CERTIFICATE OF EDUCATION BOARD

Technical and Vocational Education Examination

INTERMEDIATE LEVEL

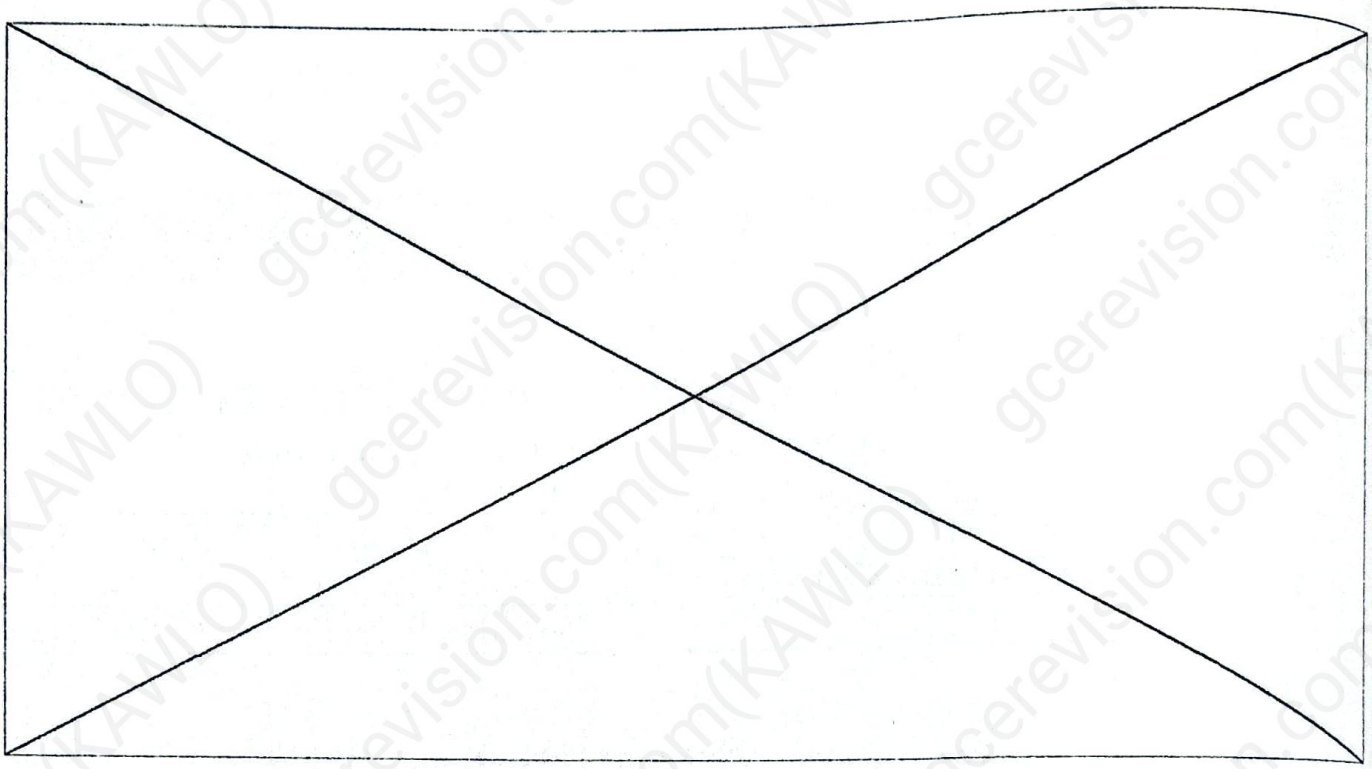
SUBJECT TITLE	SUBJECT CODE	PAPER NUMBER
MECHANICAL DRAWING	**5145**	**2**
	EXAMINATION DATE: **JUNE 2025**	

Duration: Three Hours

- You are advised to read carefully through the question paper before you begin answering
- The work to be done comprises two independent sections:
  - **SECTION A: Technological study (20 marks). Answer 5 questions**
  - **SECTIONB: Graphical study (30 marks). Answer all questions**
- Answer the questions neatly in the spaces provided in the answer sheet.
- All questions carry equal marks.
- This paper is rated at 60 of the entire paper.
- **Calculators are allowed.**

You are reminded of the necessity for good English and orderly presentation in your answers. In calculation you are advised to show all the steps in your working, giving your answer at each stage.

FOR EXAMINER`S USE ONLY	
Marked by: …… *Signature:* ……*Date:* ……	*SCORE*
Checked by: …… *Signature:* ……*Date:* ……	



SECTION A:

TECHNOLOGICAL STUDY (20 marks)

QUESTION 1: IDENTIFICATION AND FUNCTION OF THE PARTS.

1.1 Name the following parts: 19, 3, 6 and 4.

Part	Name	Part	Name
19		6	
3		4	

1.2 Give the functions of the following parts: 19, 3, 6 and 4.

19:.....

.....

.....

.....

3:.....

.....

.....

6:.....

.....

.....

4:.....

.....

.....

QUESTION 2: KNOWLEDGE OF MATERIALS AND DESIGNATION

2.1 In which family of material do the following parts **1**, **2** and **20** belong? (Thick the correct answer).

Parts	Family of materials			
	Cast iron	Rubber/plastic	Aluminium and alloys	Copper and alloys
1				
3				
20				

2.2 The shaft **2** is made from **40Cr Ni Mo 6 - 12**. Decode this designation

40: .....

Cr: .....

Ni: .....

Mo: .....

6: .....

12: .....

QUESTION 3: LINKAGES

3.1 From the knowledge of linkage, identify the type of link between pieces **2** and **3**; **2** and **1**

Part references	Type of link
2 and **3**	
2 and **1**	

3.2 Give three characteristics and the mode of the link between pieces **2** and **3**;

Part references	Characteristics of the linkage		
2 and **3**			

3.3 Indicate the number of degree of freedom permitted by each link

Part references	Number of degree of freedom
2 and **3**	
2 and **1**	

QUESTION 4: DESIGNATION OF FASTENERS (4 marks)

4.1 Give the standard designation of the following pieces: **19** and **8**.

Part	Standard Designation
19	.....
8	.....

4.2 Give the name of the assembling element used to assemble the machine on the bench.

t.....

QUESTION 5: LUBRICATION AND SEALING (4 marks)

5.1 Propose the type of lubrication used in this mechanism.

.....

.....

5.2 Justify your answer.

.....

.....

.....

QUESTION 6: TOLERANCE AND FIT

On the drawing assembly, the fit between the shaft **2** and the bushing **20** is: **Ø35 H7g6.** Knowing that **Ø35 H7=** $\emptyset 35_{0}^{+25}$ and **Ø20 g6=** $\emptyset 20_{-25}^{-9}$,

4.1 Determine the minimum and maximum allowance

J_{Max}=.....

.....

.....

J_{Mini}=.....

.....

.....

4.2 Deduce the type of fit.

.....

QUESTION 7: FUNCTIONAL DIMENSIONING.

5.1 Plot the minimal chain of dimensions related to the clearance **b** as shown in **figure 1** below.

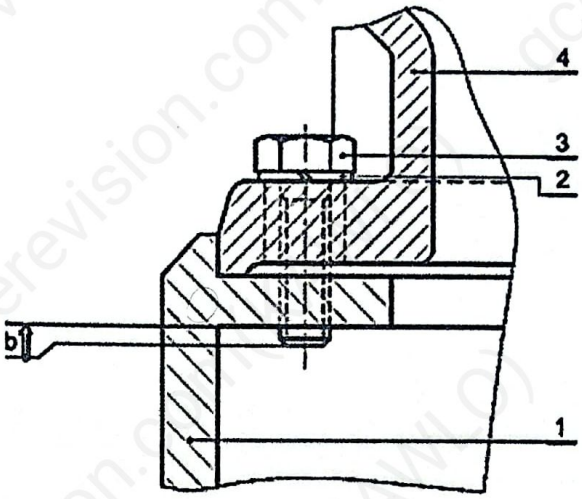


Figure 1

5.2 Write down the equations that permit to determine the maximum and minimum dimensions of piece **3**.

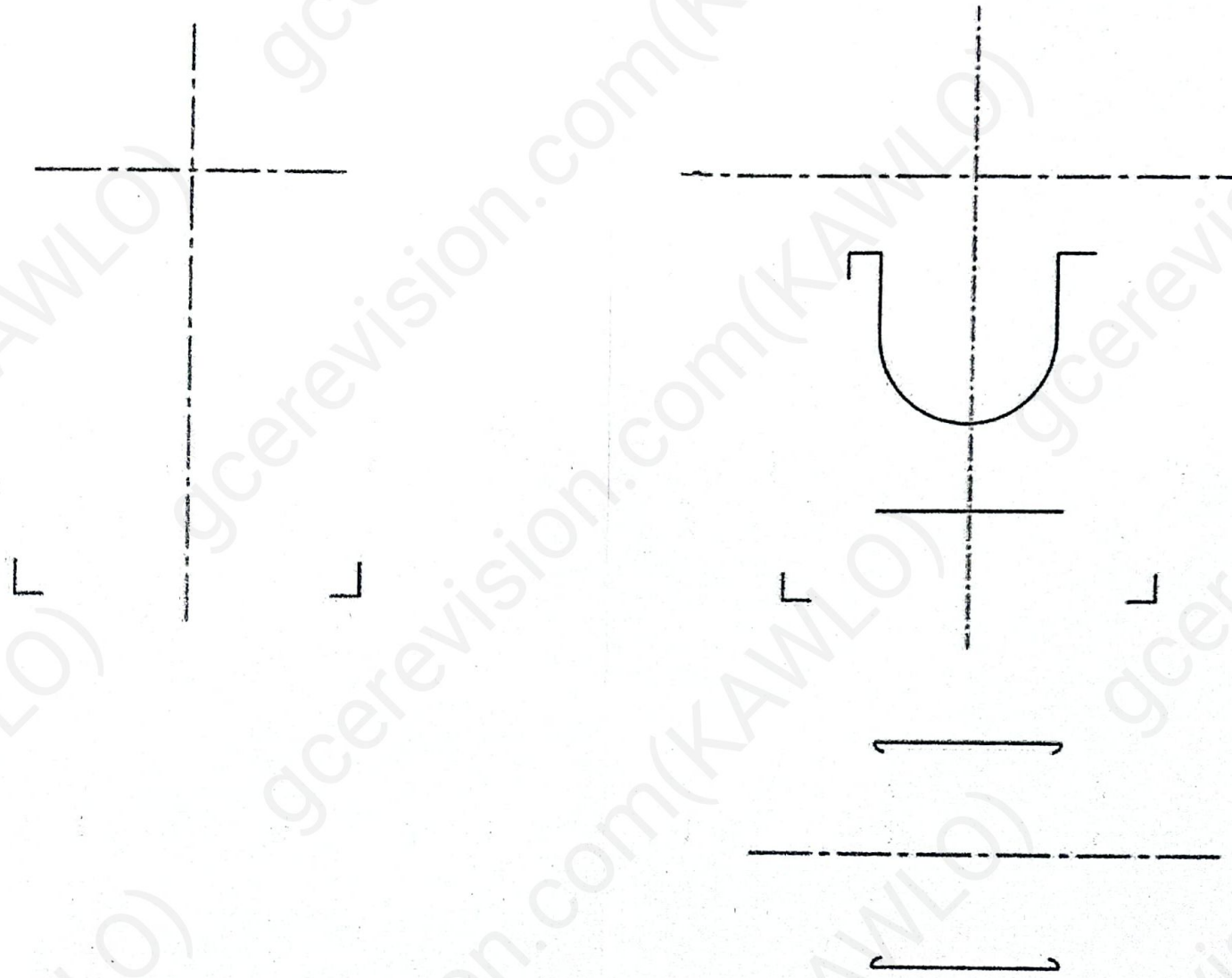
b_3Max=.....
.....
.....
b_3Mini=.....
.....
.....
.....

SECTION B
GRAPHICAL STUDY (30 marks)

Complete the detail drawing of the body **1** on **A3H** pre-printed paper (**Appendix 2/2**) in scale **1:1** in:

- Front view section A-A;
- Top view C-C;
- Left side view B-B.

Appendix 2: Detailed Drawing of body 1



GCE BOARD		
scale: 1:1	BODY 1	A3H Duration: 3H
20... Session	ITVE - MAME and ARM	

00/5145/2