ISEBE LEMFUNDO LEMPUMA KOLONI
EASTERN CAPE EDUCATION DEPARTMENT
OOS-KAAP ONDERWYSDEPARTEMENT

NATIONAL SENIOR CERTIFICATE

GRADE 12

DEAF LEARNERS

ENGINEERING GRAPHICS AND DESIGN P2

SEPTEMBER 2023

PREPARATORY EXAMINATION

MARKS: 200

TIME: 3 hours

This question paper consists of 6 pages.

INSTRUCTIONS AND INFORMATION

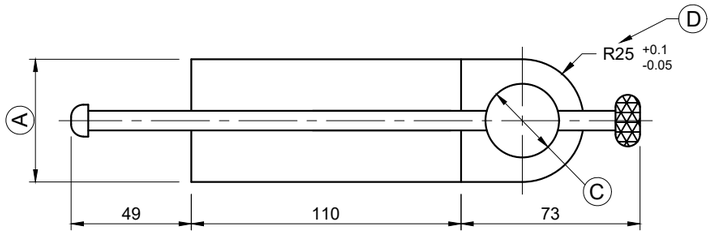
1. The question paper consists of FOUR questions.
2. Answer ALL the questions.
3. ALL drawings must be drawn to scale 1 : 1, unless otherwise stated.
4. ALL the questions must be answered on the answer sheets provided.
5. ALL the answer sheets must be re-stapled in numerical sequence and handed in irrespective of whether the question was attempted or not.
6. Careful time management is essential in order to complete all the questions.
7. Print your name in the block provided on every ANSWER SHEET.
8. ALL answers must be drawn accurately and neatly.
9. Any details or dimensions not given must be estimated in good proportion.
10. ALL drawings are in third angle orthographic projection, unless otherwise stated.

FOR OFFICIAL USE ONLY								
					MODERATED MARK			
1								
2								
3								
4								
TOTAL								
	2	0	0		2	0	0	

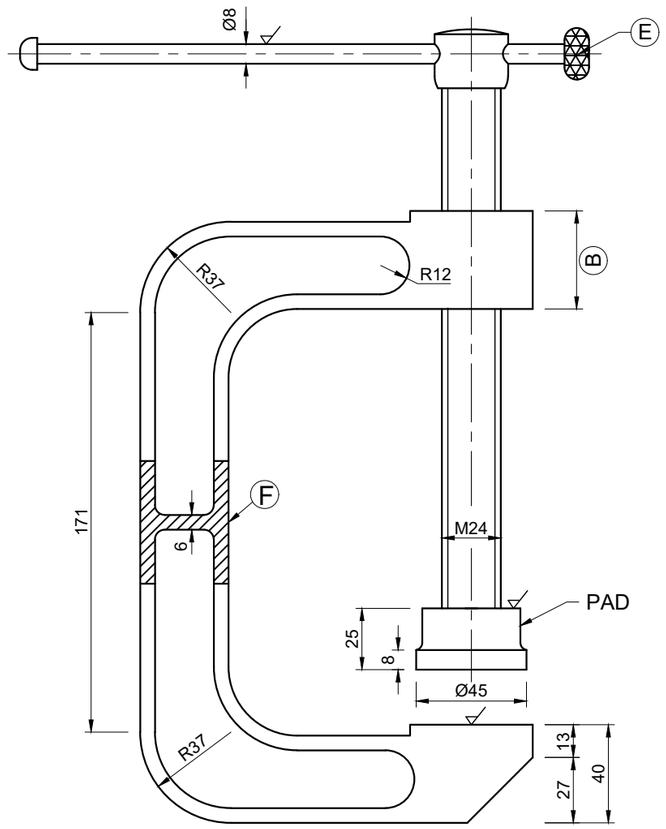
FINAL CONVERTED MARK	CHECKED BY
100	

COMPLETE THE FOLLOWING:
NAME
NAME
EXAMINATION CENTRE
SCHOOL

STAPLE



VIEW 1



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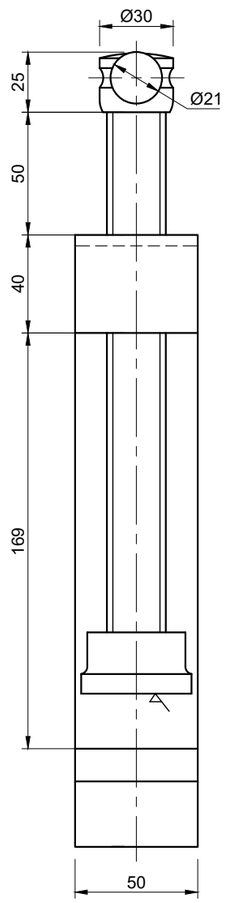
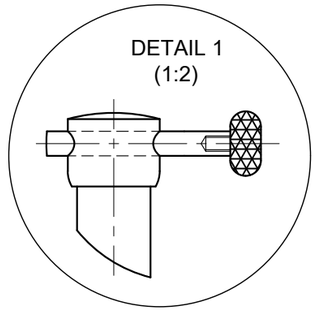
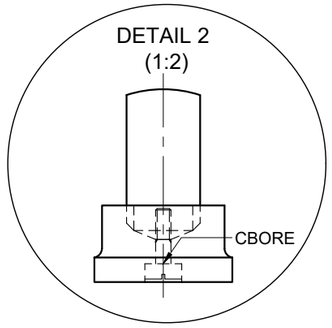


VIEW 3





QUESTION 1: ANALYTICAL (MECHANICAL)

Given:
A detailed drawing of a G-clamp, a title block and table of questions. The drawings are not presented to the indicated scale.

Instructions:
Complete the table below by neatly answering the questions, which all refer to the accompanying drawings, the title block and mechanical content. **[29]**

	QUESTIONS	ANSWERS		
1	Which engineering firm prepared the drawing?		1	
2	On what date was the drawing drawn?		1	
3	From what material is the tommy bar made of?		1	
4	How many clamps need to be manufactured?		1	
5	What does the abbreviation 'CBORE' stand for?		1	
6	What type of section is indicated at F?		1	
7	What would VIEW 2 be called?		2	
8	Determine the total height of the clamp, as it is drawn.		1	
9	What is the file name?		1	
10	What is the feature at E?		1	
11	What is the depth of the thread on a standard M5 bolt?		1	
12	Determine the complete dimensions at : A: B: C:		3	
13	What is the purpose of the detail views?		1	
14	How many surfaces need to be machined?		1	
15	What is the size of the biggest work piece that can be clamped?		1	
16	With reference to the tolerance, determine the minimum dimension at D.		2	
17	With reference to the machining symbol, what is indicated by the label 'N2'?		1	
18	In the space provided below, draw, in neat freehand, the convention for a bearing.		4	
19	In the space below, draw, in neat freehand, the SANS symbol for the projection system used.		4	
		TOTAL	29	

RELYENGINEERING	15 CLAMPERY RD. BOUREMOUTH 9347 ☏ 045 730 5801
TITLE: **G-CLAMP**	
ALL DIMENSIONS ARE IN MILLIMETRES.	SCALE: 1 : 4
PROGRAMME: AUTOCAD 2023	
FILE NAME: RXH-2023-182.dwg	
DRAWING NO: 22	
QUANTITY: 400	

PARTS LIST

	PART	MATERIAL	QUANTITY
1.	FRAME	CAST IRON	1
2.	LEAD SCREW	STAINLESS STEEL	1
3.	PAD	MILD STEEL	1
4.	TOMMY BAR	MILD STEEL	1
5.	CAP SCREW	MILD STEEL	1

APPROVED:	REY	2022/03/15
CHECKED:	TYLER	2023/04/16
DRAWN:	SHANA	2023/01/20
2.		
1.		
REVISIONS		**DATE**

N2
R

ANSWER 18

ANSWER 19

NAME

NAME 2

Please turn over

STAPLE

C

QUESTION 2: LOCI (CAM)

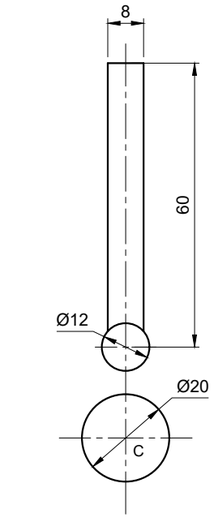
Given:
- The details of the camshaft and a roller-ended follower in the starting position.
- Reference point C on the answer sheet.

Specifications:
- Camshaft = Ø20 mm.
- The minimum distance from the cam profile to the center of the camshaft = 15 mm.
- Rotation = anti-clockwise.

Motion:
The cam imparts the following motion to the roller-follower
- It rises 20 mm with uniform motion over the first 45°.
- There is a dwell period for the next 45°.
- It rises a further 40 mm with uniform acceleration and retardation over the next 90°.
- It returns to its original position with simple harmonic motion over the remainder of the rotation.

Instructions:
- Draw to scale 1 : 1, the given camshaft and the roller follower.
- Show the direction of rotation on the cam profile.
- Draw to a rotational scale of 30° = 8 mm and a displacement scale of 1 : 1, the displacement graph for the required motion.
- Project and draw the cam profile from the displacement graph.
- Label the displacement graph and the scale.
- Show ALL construction and projection.

[38]



CAM AND FOLLOWER DETAIL

ASSESSMENT CRITERIA			
1	GIVEN + MINIMUM DISTANCE + CENTRE LINES	5	
2	GRAPH CONSTRUCTION	$5\frac{1}{2}$	
3	DISPLACEMENT GRAPH	$9\frac{1}{2}$	
4	CAM CONSTRUCTION	5	
5	CAM + CURVE QUALITY	13	
PENALTY (-)			
	TOTAL	**38**	

NAME
NAME 3

STAPLE

QUESTION 3: ISOMETRIC

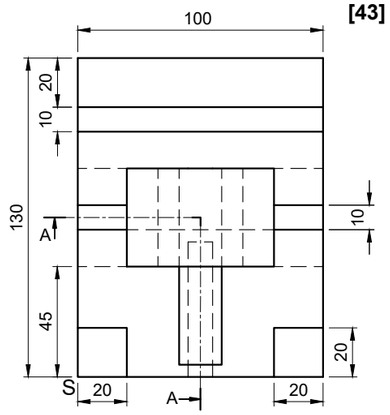
Given:

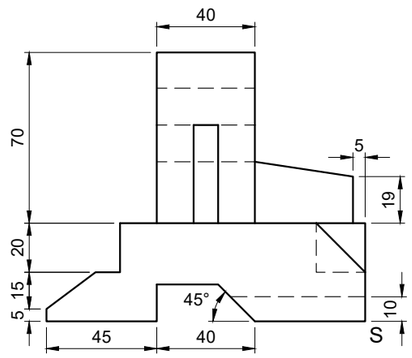
- Three views of a SUPPORT BRACKET in third angle orthographic projection.
- Cutting plane A-A as seen in the top view.
- Starting point S.

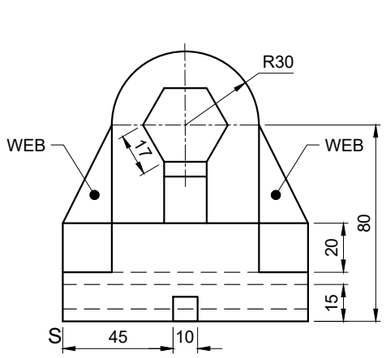
Instructions:

- Draw, to scale 1 : 1, a sectional isometric view of the SUPPORT BRACKET.
- Make point S the lowest point of the drawing.
- Show ALL necessary construction.
- NO hidden detail is required.

[43]





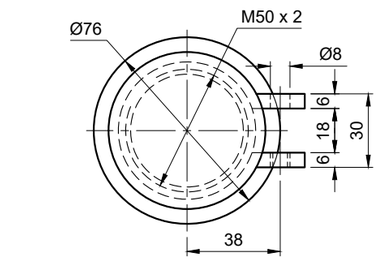


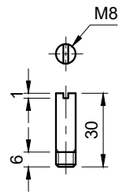
S

ASSESSMENT CRITERIA			
1	CONSTR' + PLACEMENT	2	
2	BASE	11½	
3	TOWER + HEXAGON + CIRCLE	15	
4	SECTION A-A	14½	
	TOTAL	**43**	

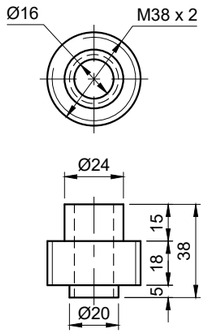
NAME	
NAME	4

KRAM

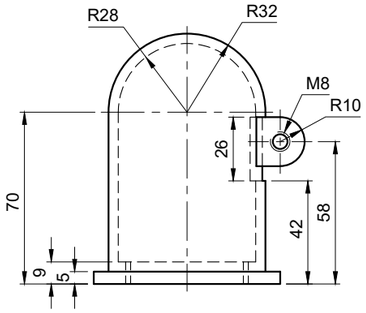




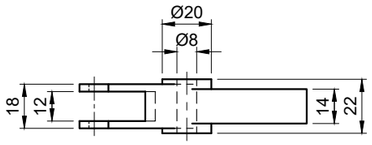
PIN (2)

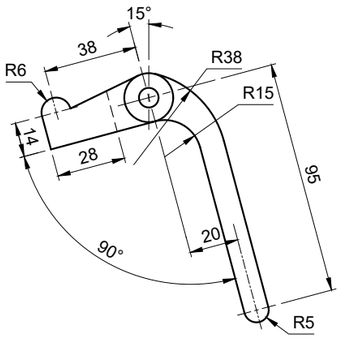


SPRING SEAT (5)

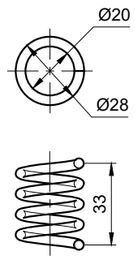


CAP (1)

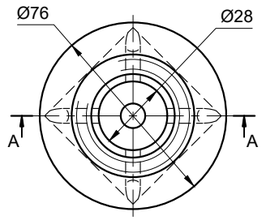


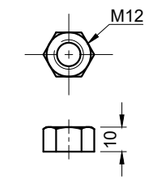


LEVER (3)

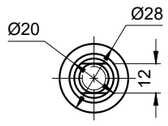


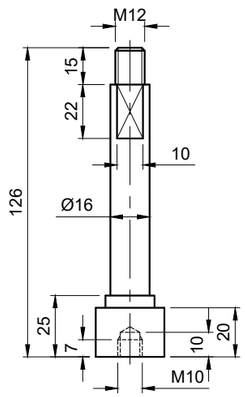
SPRING (6)



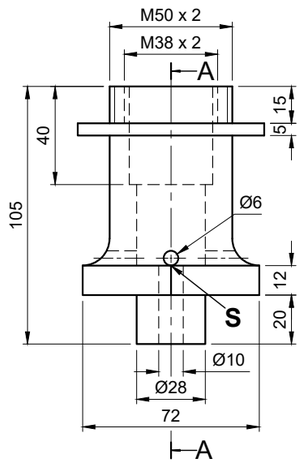


M12 NUT (4)

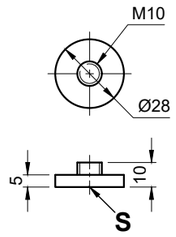




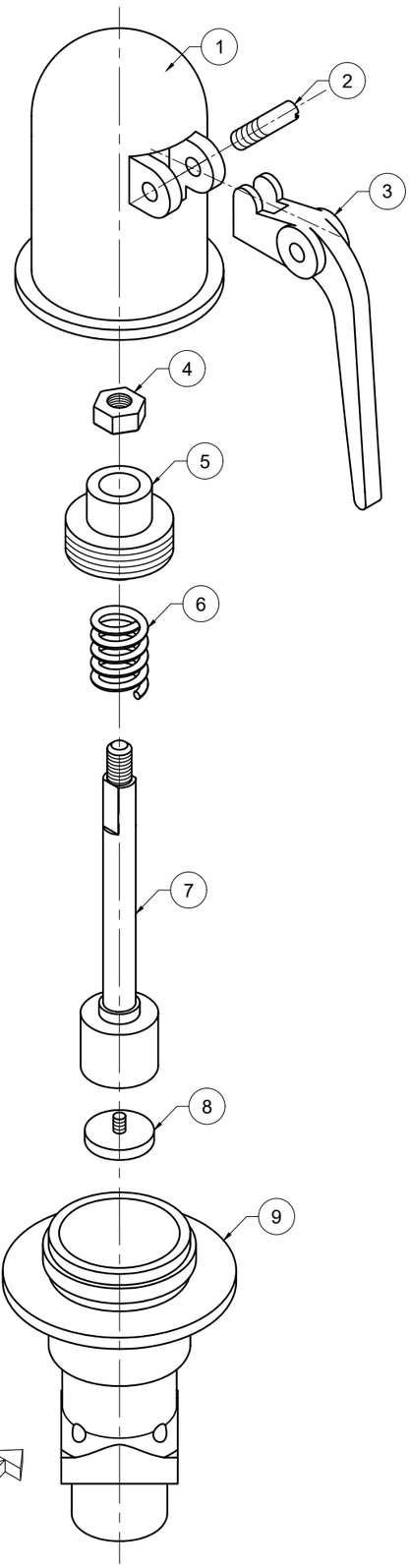
SPINDLE (7)



HOUSING (9)



DISC (8)



QUESTION 4: MECHANICAL ASSEMBLY

Given:

- Orthographic views of each of the parts of the safety valve.
- The exploded isometric drawing of the parts of a safety valve assembly, showing the position of each part relative to the others.
- Starting point S on the answer sheet, page 6.

Instructions:

- Answer this question on page 6.
- Draw, to scale 1 : 1 and in third angle orthographic projection, the following views of the assembled parts of the safety valve.
  - 4.1 ONLY the front half of **the top view,** by applying the convention of symmetry.
  - 4.2 **The sectional front view**, on cutting plane A-A, as seen from the direction of the arrow shown on the exploded isometric drawing. The cutting plane is shown on the top view of the housing (part 9).

NOTE:

1. Starting point S is indicated on the front views of the housing (part 9) and the disc (part 8).
2. Show THREE faces of the M12 nut in the sectional front view.
3. Show ALL construction.
4. NO hidden detail is required.
5. Make use of a partial section to indicate the screw at the bottom of the spindle.
6. All drawings must comply with the guidelines contained in *SANS 10111*.

Add the following features on the drawing:

- The cutting plane A-A in the **TOP VIEW**.
- The convention symbol to indicate symmetry in the **TOP VIEW**.

[90]

TITLE:

SAFETY VALVE

QUALITY-VALVE INC.

15 CLAMPERY RD.
BOUREMOUTH
9347
☎ 045 730 5801

ALL DIMENSIONS ARE IN MILLIMETRES.

ALL UNSPECIFIED RADII ARE R5.

PARTS LIST

PART	MATERIAL	QUANTITY
1. CAP	CARBON STEEL	1
2. PIN	MILD STEEL	1
3. LEVER	MILD STEEL	1
4. M12 NUT	TOOL STEEL	1
5. SPRING SEAT	MILD STEEL	1
6. SPRING	STAINLESS STEEL	1
7. SPINDLE	STAINLESS STEEL	1
8. DISC	BRONZE	1
9. HOUSING	CAST IRON	1

Please turn over

STAPLE

S

PENALTIES		
1	WRONG SCALE	
2	PARTS NOT ASSEMBLED	
3	WRONG HATCHING	
	TOTAL PENALTIES (-)	

ASSESSMENT CRITERIA			
TOP VIEW			
1	LEVER	1	
2	CAP	$2\frac{1}{2}$	
3	CONVEN, SYMMETRY LINES + CUTTING PLANE	4	
	SUB-TOTAL	**$7\frac{1}{2}$**	
SECTIONAL FRONT VIEW			
1	CAP	$11\frac{1}{2}$	
2	PIN	1	
3	LEVER	$5\frac{1}{2}$	
4	SPRING SEAT	7	
5	HOUSING	$19\frac{1}{2}$	
6	M12 NUT	$6\frac{1}{2}$	
7	SPRING	$1\frac{1}{2}$	
8	SPINDLE	16	
9	DISC	3	
	SUB-TOTAL	**$71\frac{1}{2}$**	
GENERAL			
1	CENTRE LINES	3	
2	ASSEMBLY	8	
	SUB-TOTAL	**11**	
	TOTAL	**90**	
	PENALTIES (-)		
	GRAND TOTAL	**90**	
NAME			
NAME			6