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Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

**NATIONAL
SENIOR CERTIFICATE**

GRADE 12

ENGINEERING GRAPHICS AND DESIGN P2

NOVEMBER 2022

MARKS: 100

TIME: 3 hours

This question paper consists of 6 pages.

Barcode label

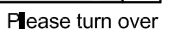
INSTRUCTIONS AND INFORMATION

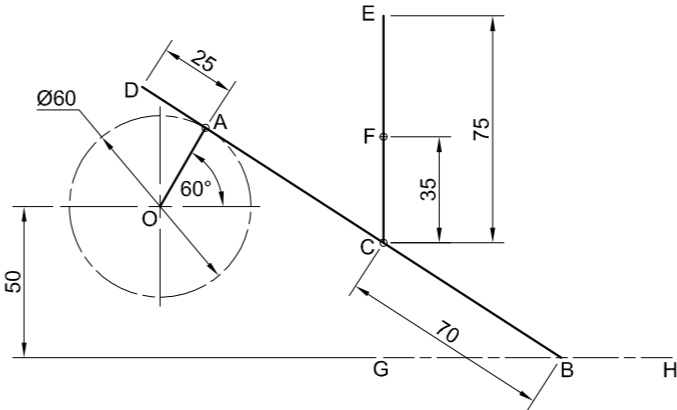
1. This question paper consists of FOUR questions.
2. Answer ALL the questions.
3. ALL drawings are in third-angle orthographic projection, unless otherwise stated.
4. ALL drawings must be prepared using pencil and instruments, unless otherwise stated.
5. ALL answers must be drawn accurately and neatly.
6. ALL the questions must be answered on the QUESTION PAPER, as instructed.
7. ALL the pages, irrespective of whether the question was attempted or not, must be re-stapled in numerical sequence in the TOP LEFT-HAND CORNER ONLY.
8. Time management is essential in order to complete all the questions.
9. Print your examination number in the block provided on every page.
10. Any details or dimensions not given must be assumed in good proportion.

FOR OFFICIAL USE ONLY															
QUESTION	MARKS OBTAINED			$\frac{1}{2}$	SIGN	MODERATED			$\frac{1}{2}$	SIGN	RE-MARKING			$\frac{1}{2}$	SIGN
1															
2															
3															
4															
TOTAL															
	2	0	0			2	0	0			2	0	0		

FINAL CONVERTED MARK	CHECKED BY
100	

COMPLETE THE FOLLOWING:
CENTRE NUMBER
CENTRE NUMBER
EXAMINATION NUMBER
EXAMINATION NUMBER





QUESTION 2: LOCI

NOTE: Answer QUESTIONS 2.1 and 2.2.

2.1 MECHANISM

- Given:
- A schematic drawing of a mechanism consisting of crank OA, sliding rod DB, horizontal groove GH, swivel guide F and rod CE in its vertical position
 - The position of centre point O on the drawing sheet
- Specifications:
- The positions of centre point O, swivel guide F and horizontal groove GH are fixed.
 - Rod DB = 165.
 - Sliding rod DB is pin-jointed to crank OA at A.
 - Rod CE passes through swivel guide F, and is pin-jointed to sliding rod DB at C.
- Motion:
- As crank OA rotates, point B of sliding rod DB reciprocates along groove GH and rod CE slides through swivel guide F.
- Instructions:
- Draw, to scale 1:1, the given schematic drawing of the mechanism.
 - Trace the loci generated by point D and by point E for ONE complete rotation of crank OA.
 - Show ALL construction.

ASSESSMENT CRITERIA 2.1					
1	GIVEN + LABELS + CL	6			
2	CONSTRUCTION	5			
3	LOCI OF D AND E	14			
PENALTIES (-)					
SUBTOTAL		25			

2.2: CAM

- Given:
- The position of corner P on the drawing sheet
- Motion:
- A cam imparts the following motion to a follower:
- It is at rest for the first 60°.
 - It rises 80 mm with uniform acceleration and retardation over the next 150°.
 - It returns to its original position with uniform motion over the rest of the rotation.

- Instructions:
- From corner P, draw, to a rotational scale of 10 mm = 30° and a displacement scale of 1 : 1, the complete displacement graph for the required motion.
 - Label the displacement graph and include the rotational scale.
 - Show ALL construction.



ASSESSMENT CRITERIA 2.2					
1	GRAPH CONSTRUCTION	5			
2	POINTS + CURVE	6			
3	LABELS	1			
PENALTIES (-)					
SUBTOTAL 2.2		12			
SUBTOTAL 2.1		25			
TOTAL		37			

EXAMINATION NUMBER

EXAMINATION NUMBER

3

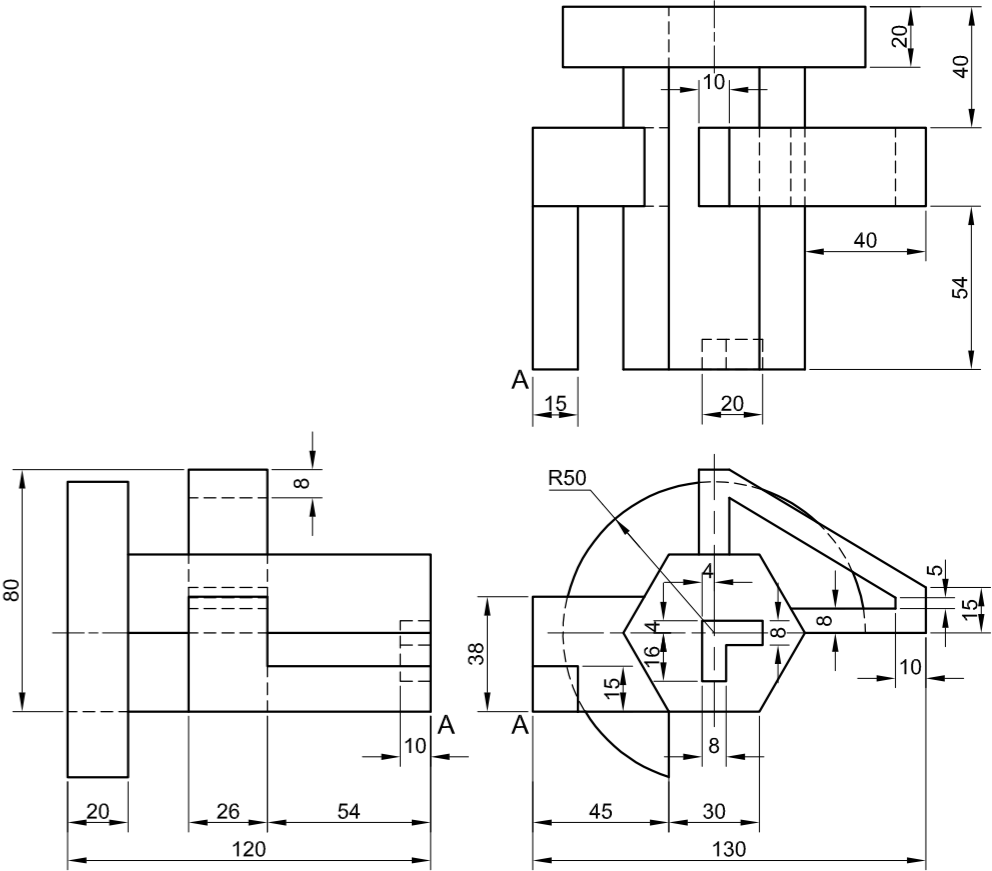


QUESTION 3: ISOMETRIC DRAWING

- Given:**
- The front view, top view and left view of a tool
 - The position of point A on the drawing sheet

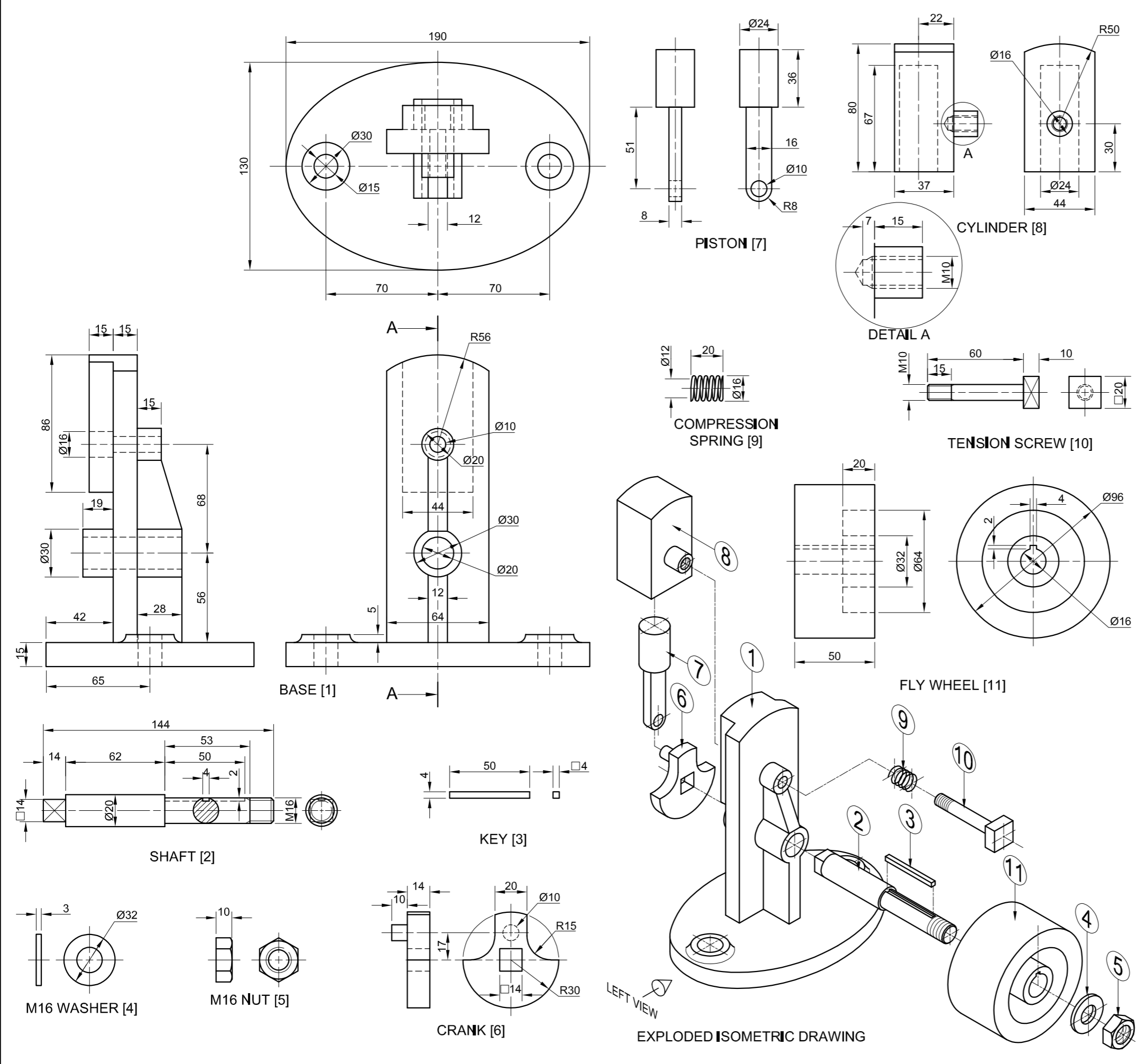
Instructions:
Using scale 1 : 1, convert the orthographic views of the tool into an isometric drawing.

- Make A the starting and lowest point of the drawing.
 - Show ALL construction.
 - NO hidden detail is required.
- [40]



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A

ASSESSMENT CRITERIA				
1	PLACING + AUX. VIEW	2		
2	BODY	20		
3	HANDLE	9 1/2		
4	CIRCLES + CONSTR. + CL	8 1/2		
PENALTIES (-)				
TOTAL		40		
EXAMINATION NUMBER				
EXAMINATION NUMBER				4



QUESTION 4: MECHANICAL ASSEMBLY

Given:

- The exploded isometric drawing of the parts of a wobble engine assembly, showing the position of each part relative to all the others
- Orthographic views of each of the parts of the wobble engine assembly

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 wobble engine assembly:
 - 4.1 ONLY the left half of the front view, by applying the convention of symmetry.
 - 4.2 A sectional left view on cutting plane A-A, as seen from the direction of the arrow on the exploded isometric drawing. The cutting plane is shown on the front view of the base (part 1).

NOTE:

- Planning is essential.
- The drawing must comply with the SANS 10111 guidelines.
- The piston (part 7) must be drawn in the highest position.
- Show THREE faces of the M16 nut (part 5) on the sectional view.
- The compression spring (part 9) must be drawn as a conventional representation, at the full extension of 20 mm.
- NO hidden detail is required.

[93]

PARTS LIST			
PARTS		QUANTITY	MATERIAL
1	BASE	1	CAST IRON
2	SHAFT	1	MILD STEEL
3	KEY	1	KEY STEEL
4	M16 WASHER	1	MILD STEEL
5	M16 NUT	1	MILD STEEL
6	CRANK	1	CAST IRON
7	PISTON	1	MILD STEEL
8	CYLINDER	1	CAST IRON
9	COMPRESSION SPRING	1	SPRING STEEL
10	TENSION SCREW	1	MILD STEEL
11	FLY WHEEL	1	CAST IRON

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WOBBLE ENGINE ASSEMBLY

ALL DIMENSIONS ARE IN MILLIMETRES.



5



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INCORRECT ORTHOGRAPHIC PROJECTION	
INCORRECT OVERALL SCALE	
INCORRECT HATCHING	
PARTS NOT ASSEMBLED	
TOTAL PENALTIES (-)	

ASSESSMENT CRITERIA					
FRONT VIEW					
		POSSIBLE	OBTAINED	SIGN	MODERATED
1	BASE	5 ¹ / ₂			
2	TENSION SCREW	1 ¹ / ₂			
3	FLY WHEEL	1			
4	NUT + WASHER	4 ¹ / ₂			
5	INDICATION OF SYMMETRY	2			
SUBTOTAL		14 ¹ / ₂			
SECTIONAL LEFT VIEW					
1	BASE	13 ¹ / ₂			
2	CYLINDER	10			
3	PISTON	5 ¹ / ₂			
4	TENSION SCREW	8			
5	SPRING	1 ¹ / ₂			
6	CRANK	5 ¹ / ₂			
7	SHAFT + KEY + WASHER + NUT	15 ¹ / ₂			
8	FLY WHEEL	7			
SUBTOTAL		66 ¹ / ₂			
GENERAL					
1	CENTRE LINES	2			
2	ASSEMBLY	10			
SUBTOTAL		12			
TOTAL		93			
PENALTIES (-)					
GRAND TOTAL					
EXAMINATION NUMBER					
EXAMINATION NUMBER					6