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basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL
SENIOR CERTIFICATE

GRADE 12

ENGINEERING GRAPHICS AND DESIGN P2

NOVEMBER 2021

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

100

CHECKED BY

COMPLETE THE FOLLOWING:

CENTRE NUMBER

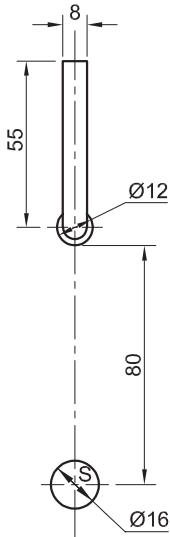
CENTRE NUMBER

EXAMINATION NUMBER

EXAMINATION NUMBER



S



ROLLER-FOLLOWER AND
CAMSHAFT DETAIL

QUESTION 2: LOCI (CAM)

- Given:**
- The detail of a camshaft and a roller-follower at the maximum distance from the camshaft centre
 - The position of centre point S on the drawing sheet

- Specifications:**
- The roller-follower reciprocates along the vertical centre line that passes through the centre of the camshaft
 - The **minimum** distance from the **circumference** of the roller of the follower to the centre of the camshaft = 14 mm
 - Rotation = anti-clockwise

- Motion:**
- The cam imparts the following motion to the roller-follower:
- There is a dwell period for the first 45°
 - It then descends 22 mm with uniform motion over the next 45°
 - It descends to its minimum distance with simple harmonic motion over the next 90°
 - It returns to its original position with uniform acceleration and retardation over the remainder of the rotation

- Instructions:**
- Using centre point S on the drawing sheet, draw, to scale 1 : 1, the camshaft and roller-follower in the given position.
 - Draw to a rotational scale of 30° = 8 mm and a displacement scale of 1 : 1, the complete displacement graph for the required motion.
 - Project and draw the cam profile from the displacement graph.
 - Show the direction of rotation on the cam profile.
 - Show ALL construction and projection. [38]

ASSESSMENT CRITERIA					
1	GIVEN + MINIMUM DISTANCE + CL	5			
2	GRAPH CONSTRUCTION	6			
3	PLOTTING GRAPH + GRAPH CURVES	8 1/2			
4	CAM CONSTRUCTION	5			
5	PLOTTING + CAM PROFILE	13 1/2			
PENALTIES (-)					
TOTAL		38			
EXAMINATION NUMBER					
EXAMINATION NUMBER					3

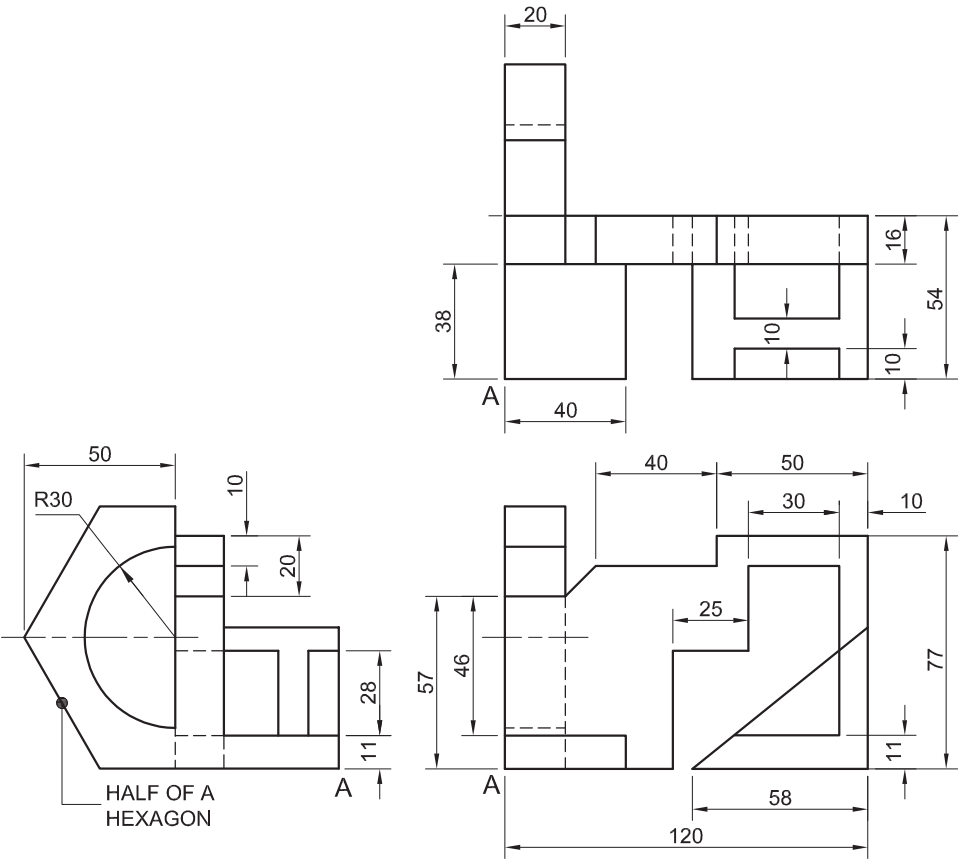


QUESTION 3: ISOMETRIC DRAWING

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

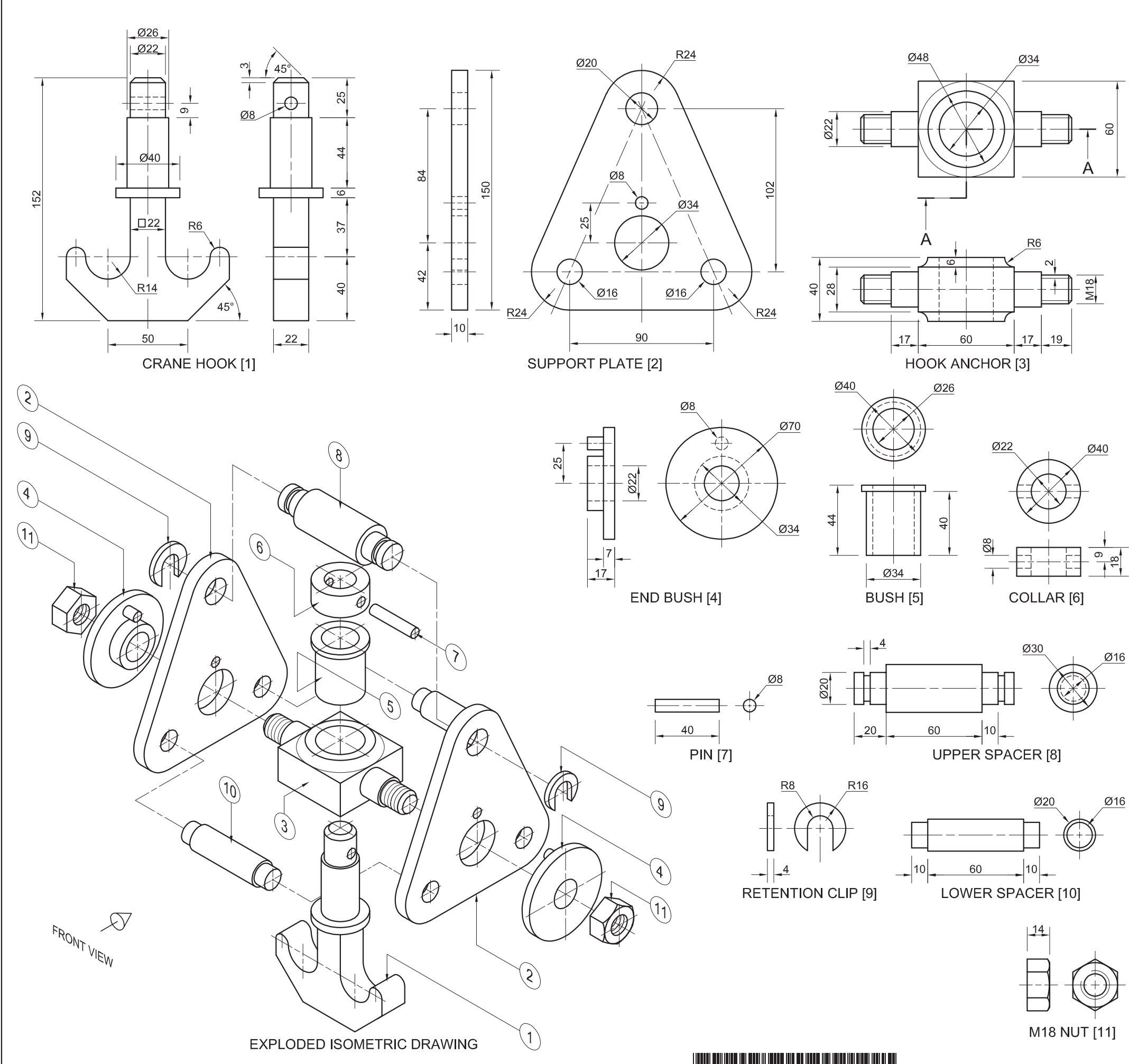
Instructions:
Using scale 1 : 1, convert the orthographic views of the gauge into an isometric drawing.

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



↓
A

ASSESSMENT CRITERIA				
1	PLACING + AUX. VIEW	2		
2	FRONT + MIDDLE SURFACES	16 ¹ / ₂		
3	SLOPED SURFACE	11		
4	CIRCLE + HEXAGON	10 ¹ / ₂		
PENALTIES (-)				
TOTAL		40		
EXAMINATION NUMBER				
EXAMINATION NUMBER				4



QUESTION 4: MECHANICAL ASSEMBLY

- Given:**
- The exploded isometric drawing of the parts of a crane hook assembly, showing the position of each part relative to all the others
 - Orthographic views of each of the parts of the crane hook 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 crane hook assembly:

- 4.1 The right view.**
- 4.2 A half sectional front view** on cutting plane A-A. Show the right half in section, as seen from the direction of the arrow as shown on the exploded isometric drawing. The cutting plane is shown on the top view of the hook anchor (part 3).

- NOTE:**
- Planning is essential.
 - The drawing must comply with the *SANS 10111* guidelines.
 - The convention of symmetry may NOT be applied.
 - Show **THREE** faces of the M18 nut (part 11) on the right side and **TWO** faces of the M18 nut (part 11) on the left side of the half sectional view.
 - NO hidden detail is required.

[92]

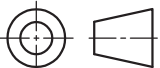
PARTS LIST			
PARTS		QUANTITY	MATERIAL
1	CRANE HOOK	1	FORGED STEEL
2	SUPPORT PLATE	2	MILD STEEL
3	HOOK ANCHOR	1	MILD STEEL
4	END BUSH	2	MILD STEEL
5	BUSH	1	MILD STEEL
6	COLLAR	1	MILD STEEL
7	PIN	1	MILD STEEL
8	UPPER SPACER	1	MILD STEEL
9	RETENTION CLIP	2	MILD STEEL
10	LOWER SPACER	2	MILD STEEL
11	M18 NUT	2	MILD STEEL

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012 345 6789

CRANE HOOK ASSEMBLY

ALL DIMENSIONS ARE IN MILLIMETRES.



5



FOR OFFICIAL USE ONLY	
INCORRECT ORTHOGRAPHIC PROJECTION	
INCORRECT OVERALL SCALE	
INCORRECT HATCHING	
PARTS NOT ASSEMBLED	
TOTAL PENALTIES (-)	

ASSESSMENT CRITERIA					
RIGHT VIEW					
		POSSIBLE	OBTAINED	SIGN	MODERATED
1	CRANE HOOK	2 ¹ / ₂			
2	SUPPORT PLATES + LOWER SPACERS	4			
3	HOOK ANCHOR + END BUSH	2			
4	RETENTION CLIP + UPPER SPACER	2			
5	M18 NUT	2 ¹ / ₂			
SUBTOTAL		13			
HALF SECTIONAL FRONT VIEW					
1	CRANE HOOK	13			
2	SUPPORT PLATES	7			
3	HOOK ANCHOR	11			
4	END BUSHES	7 ¹ / ₂			
5	UPPER + LOWER SPACERS	8			
6	BUSH	2			
7	COLLAR + PIN	4 ¹ / ₂			
8	RETENTION CLIPS	4			
9	M18 NUTS	7			
10	NO HATCHING LEFT HALF	1			
SUBTOTAL		65			
GENERAL					
1	CENTRE LINES	3			
2	ASSEMBLY	11			
SUBTOTAL		14			
TOTAL		92			
PENALTIES (-)					
GRAND TOTAL					
EXAMINATION NUMBER					
EXAMINATION NUMBER					6

