

NATIONAL SENIOR CERTIFICATE

GRADE 12

ENGINEERING GRAPHICS AND DESIGN P2 NOVEMBER 2021

MARKS: 100

TIME: 3 hours

This question paper consists of 6 pages.

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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.

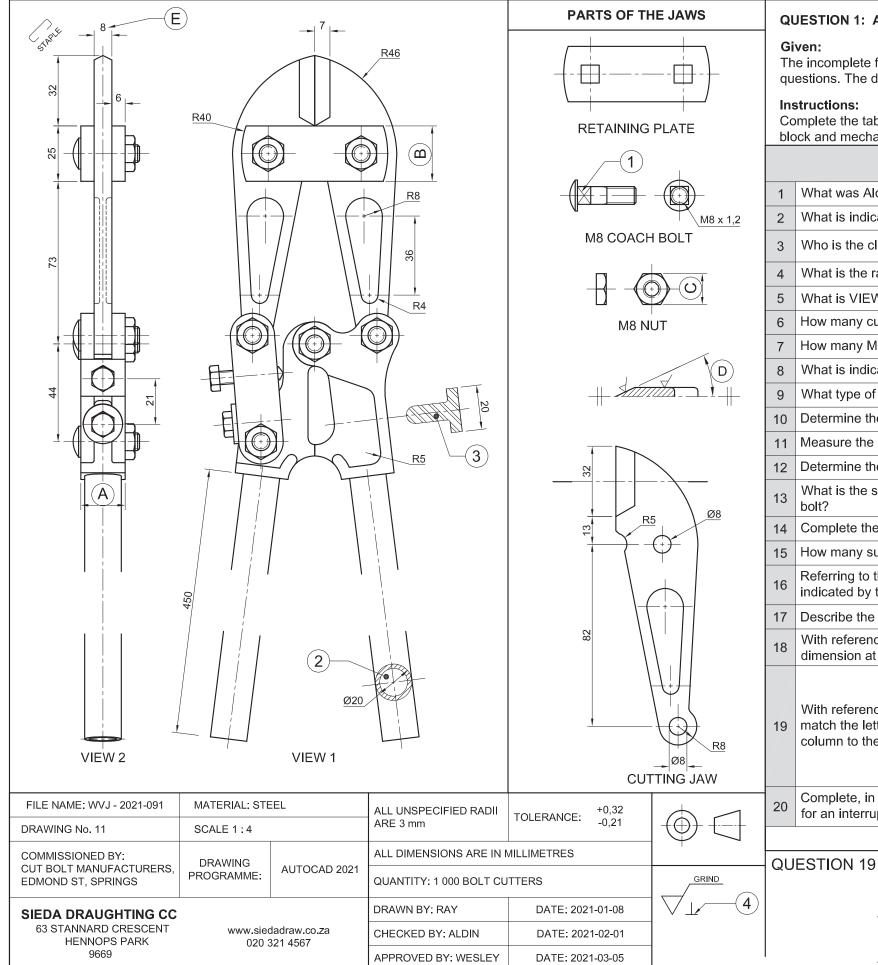
FOR OFFICIAL USE ONLY															
QUESTION	JESTION MARKS OBTAINED		AINED	1/2	SIGN	MODERATED		ED	1/2	SIGN	RE-MARKING		NG	1/2	SIGN
1															
2															
3															
4															
TOTAL															
	2	0	0			2	0	0			2	0	0		

FINAL CONVERTED MARK	CHECKED BY
100	

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

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NSC DBE/November 2021 Engineering Graphics and Design/P2



QUESTION 1: ANALYTICAL (MECHANICAL)

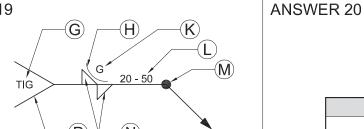
Given:

The incomplete front view and left view of a bolt cutter, views of the parts of the jaws, a title block and a table of questions. The drawings are not presented to the indicated scale.

Instructions:

Complete the table below by neatly answering the questions, which refer to the accompanying drawings, the title block and mechanical content.

	QUESTIONS	ANSWE	RS				
1	What was Aldin responsible for?		1				
2	What is indicated by the number WVJ-2021-091?		_1				
3	Who is the client that commissioned the project?						
4	What is the radius of all unspecified curves?		1		_		
5	What is VIEW 2 called?		1				
6	How many cutting jaws will be required for the full order?		1				
7	How many M8 nuts are required for each bolt cutter?		1				
8	What is indicated by the cross at 1?		1				
9	What type of section is indicated at 2?		1				
10	Determine the complete dimension at: A: B:	C:	3				
11	Measure the angle at D.		_1				
12	Determine the total length of the cutting jaw.		_1				
13	What is the specified depth of the thread on the M8 coach bolt?						
14	Complete the cutting plane on the cutting jaw by inserting the	arrows. Label the cutting plane K-	K. 3				
15	How many surfaces of the cutting jaw must be machined?		_1				
16	Referring to the machining symbol in the title block, what is indicated by the symbol at 4?		1				
17	Describe the mistake at 3.		1				
18	With reference to the tolerance, determine the minimum dimension at E.		1				
		TAIL	1				
	With reference to the welding symbol below (QUESTION 19),	CONTOUR	1				
19	match the letter on the symbol with the correct label in the	WELDING PROCESS	1				
	column to the right of this question.	FINISH SYMBOL	1				
		WELDING PITCH/SPACING	_1				
20	Complete, in neat freehand, the pipe below (ANSWER 20), by for an interrupted view, as required for the gaps in the handles		ion 3				
		TOI	TAL 30		_		



EXAMINATION NUMBER

EXAMINATION NUMBER Please turn over

BOLT CUTTER

TITLE



QUESTION 2: LOCI (CAM)

Given:

- The detail of a camshaft and a roller-follower at the maximum distance from the camshaft
- 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

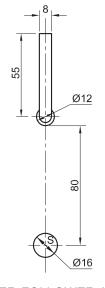
Motion:

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 rollerfollower 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
- Show ALL construction and projection. [38]



ROLLER-FOLLOWER AND CAMSHAFT DETAIL

ASSESSMENT CRITERIA										
1	GIVEN + MINIMUM DISTANCE + CL	5								
2	GRAPH CONSTRUCTION	6								
3	PLOTTING GRAPH + GRAPH CURVES	8 ½								
4	CAM CONSTRUCTION	5								
5	PLOTTING + CAM PROFILE	13 ½								
PENA	ALTIES (-)									
	TOTAL	38								
	EXAMINATION NUMBER									

EXAMINATION NUMBER



QUESTION 3: ISOMETRIC DRAWING

Given:

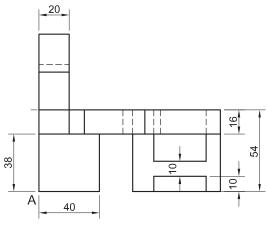
- The front view, top view and left view of a gauge
- The position of point A on the drawing sheet

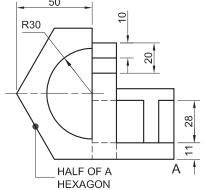
Instructions:

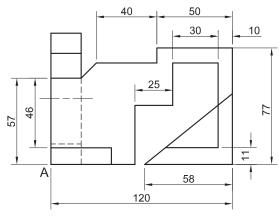
Using scale 1:1, convert the orthographic views of the gauge into an isometric drawing.

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

[40]

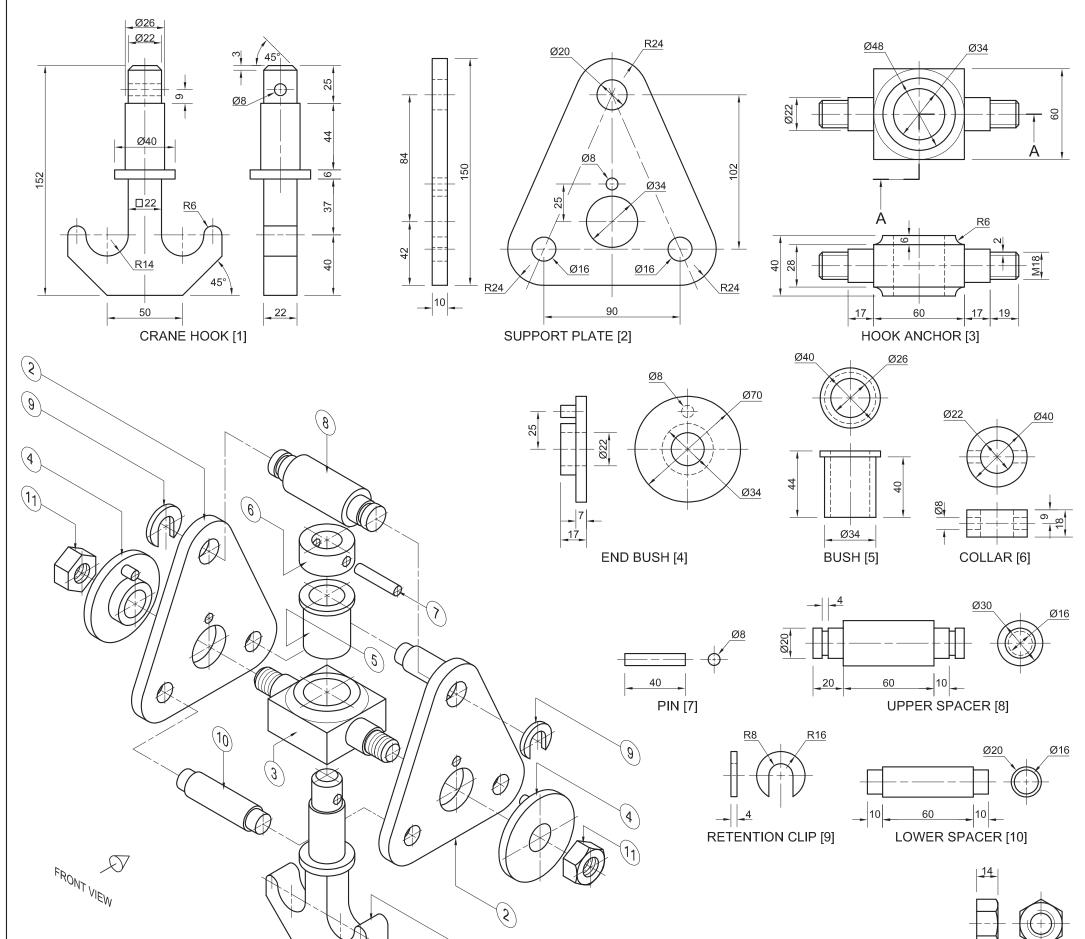






 \downarrow A

ASSESSMENT CRITERIA									
1	PLACING + AUX. VIEW	2							
2	FRONT + MIDDLE SURFACES	16 ½							
3	SLOPED SURFACE	11							
4	CIRCLE + HEXAGON	10 ½							
PE	NALTIES (-)								
TOTAL 40									
EXAMINATION NUMBER									
	EXAMINATION NUME	BER			4				



EXPLODED ISOMETRIC DRAWING

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					
	7440 070557							

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CRANE HOOK ASSEMBLY

ALL DIMENSIONS ARE IN MILLIMETRES.

M18 NUT [11]





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

ASSESSMENT CRITERIA

		RIGHT	VIEW						
		POSSIBLE	OBTAINED	SIGN	MODERATE	D			
1	CRANE HOOK	$2\frac{1}{2}$							
2 SUPPORT PLATES + LOWER SPACERS		4							
3	HOOK ANCHOR + END BUSH	2							
4	RETENTION CLIP + UPPER SPACER	2							
5	M18 NUT	$2\frac{1}{2}$							
SI	JBTOTAL	13							
	HALF SE	CTIONA	L FRON	T VIE	W				
1	CRANE HOOK	13							
2	SUPPORT PLATES	7							
3	HOOK ANCHOR	11							
4	END BUSHES	$7\frac{1}{2}$							
5 UPPER + LOWER SPACERS		8							
6	BUSH	2							
7	COLLAR + PIN	$4\frac{1}{2}$							
8	RETENTION CLIPS	4							
9	M18 NUTS	7							
10	NO HATCHING LEFT HALF	1							
SI	JBTOTAL	65							
		GENE	RAL						
1	CENTRE LINES	3							
2	ASSEMBLY	11							
SI	JBTOTAL	14							
	TOTAL	92							
PEN	NALTIES (-)								
	GRAND					_			
	EXA	OITANIMA	N NUMBEF	2					
	EXA	OITANIMA	NUMBEF	2		6			
		EXAMINATION NUMBER 6							