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basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE EXAMINATIONS/ NATIONAL SENIOR CERTIFICATE EXAMINATIONS

ENGINEERING GRAPHICS AND DESIGN P2

MAY/JUNE 2025

MARKS: 100

TIME: 3 hours

This question paper consists of 6 pages.

Barcode label

DO NOT FOLD THE QUESTION PAPER IN HALF.

Confidential

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

STAMP

VIEW 2

VIEW 1

VIEW 3

WELDING SYMBOL

PARTS LIST

NO.	PARTS	QUANTITY	MATERIAL
1	BASE PLATE	1	CAST IRON
2	CRADLE	1	CAST IRON
3	SWIVEL JAW	1	CAST IRON
4	SLIDING JAW	1	CAST IRON
5	JAW PLATES	2	MILD STEEL
6	M10 BOLT	2	CAST IRON
7	M12 NUT	2	TOOL STEEL
8	ELLIPTICAL BRACKET	1	CAST IRON

CLAMPIT TOOLS CC
4020 DAISY STREET
POLOKWANE
0330
www.clamp.co.za cell: 090 131 4330

HEAT TREATMENT:
TEMPERING AT 860°
WITH INDUCTION
HEATING

UNSPECIFIED RADII ARE R2.

TITLE: SWIVEL VICE

FILE NAME: KRJM314 **DRAWING No. CLMP02** **TOLERANCE: +0,23 -0,1**

DRAWING PROGRAM: AUTOCAD 2024 **SCALE 1 : 3**

DRAWN BY: ALISTER **DATE: 13/07/2024**

CHECKED BY: ERIC **DATE: 14/08/2024**

APPROVED BY: SAMANTHA **DATE: 05/09/2024**

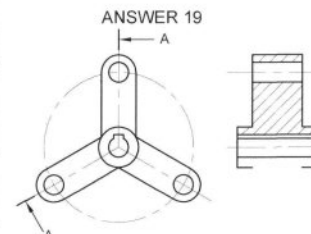
QUESTION 1: ANALYTICAL (MECHANICAL)**Given:**

Two views of a swivel vice, a welding symbol, a parts list, a title block and a table of questions. The drawing is not presented to the indicated scale.

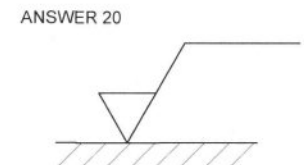
Instructions:

Complete the table below by neatly answering the questions, which refer to the accompanying drawing, title block and mechanical content. [30]

QUESTIONS		ANSWERS	
1	Who approved the drawing?	1	
2	What is the name of the company?	1	
3	Which drawing program was used to prepare the drawing?	1	
4	What projection system is indicated by the symbol in the title panel?	1	
5	From what material are the jaw plates made?	1	
6	How many M10 bolts are there in a single swivel vice assembly?	1	
7	At what temperature must the tempering be done?	1	
8	If VIEW 1 is the front view, what would VIEW 2 be called?	1	
9	What is the correct label for VIEW 3?	1	
10	Determine the complete dimensions at: A: B: C: D: E:	5	
11	Name the feature at F.	1	
12	Name the feature at G.	1	
13	If a scale of 1 : 1 was used, how would the dimension at H read?	1	
14	What type of section is shown at J?	1	
15	What type of section is shown at K?	1	
16	With reference to the welding symbol, what does M indicate?	1	
17	With reference to the welding symbol, what does '25 - 75' indicate?	25: 75:	1 1
18	With reference to the tolerance, calculate the maximum and the minimum size of the dimension at S.	MAXIMUM: MINIMUM:	1 1
19	In the space below (ANSWER 19), complete, in neat freehand, the sectional view of the given mechanical part according to cutting plane A-A.		3
20	With reference to the machining symbol in the space below (ANSWER 20), ONLY add the letters A, B and C to the symbol, in the correct position, that describe the given specifications.		3
TOTAL		30	



A = DIRECTION OF LAY
B = ROUGHNESS VALUE
C = METHOD



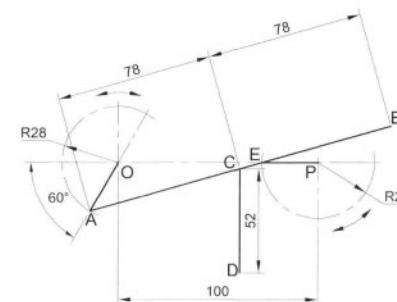
EXAMINATION NUMBER

EXAMINATION NUMBER

2

STAPLE

O

**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, slotted link AB, rod CD and crank PE
- The position of centre point O on the drawing sheet

Specifications:

- Crank OA is pin-jointed to slotted link AB at A.
- End E of crank PE slides along the slot of link AB.
- Rod CD is pin-jointed to slotted link AB at C.

Motion:

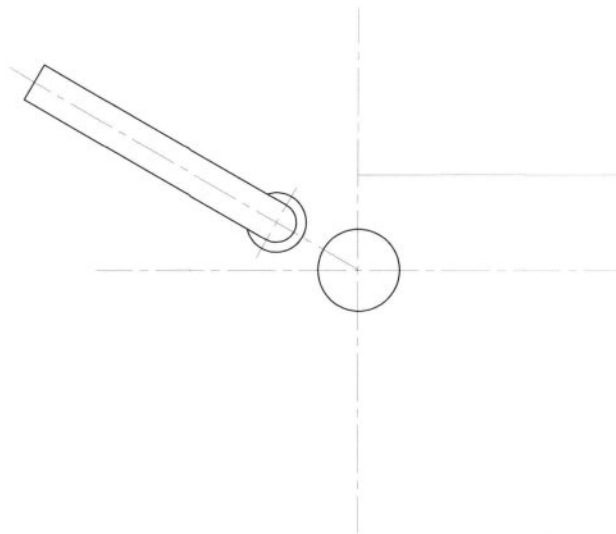
As crank OA starts its oscillation in a clockwise direction through 180° around centre point O, crank PE starts its oscillation at the same speed through 180° in an anti-clockwise direction around centre point P. During the movement, end E of crank PE reciprocates in the slot of link AB. Rod CD remains vertical throughout the movement of the two cranks.

Instructions:

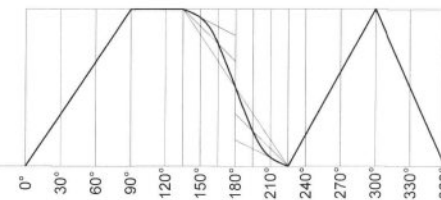
- Using centre point O, draw, to scale 1 : 1, the given schematic drawing, including the labels.
- Trace the loci generated by point B and point D for ONE oscillation.
- Show ALL construction. [20]

ASSESSMENT CRITERIA 2.1

1	GIVEN + CL	7 $\frac{1}{2}$		
2	CONSTRUCTION	4		
3	LOCUS OF B	4 $\frac{1}{2}$		
4	LOCUS OF D	4 $\frac{1}{2}$		
PENALTIES (-)				
SUBTOTAL		20 $\frac{1}{2}$		



ANSWER
MOTION FROM 135° TO 225° :



DISPLACEMENT GRAPH
SCALE 7 mm = 30°

2.2: CAM**Given:**

- The detail of a camshaft and a roller-follower at the minimum distance from the camshaft centre
- The displacement graph, correctly aligned for the given follower and camshaft

Specifications:

- The roller-follower reciprocates along the 30° centre line that passes through the centre of the camshaft.
- Roller = $\varnothing 12$
- Rotation = clockwise

Instructions:

- Project and draw the cam profile from the given displacement graph.
- Indicate the direction of rotation on the cam profile with an arrow.
- Show ALL necessary construction and projection.
- In the space provided, name the type of motion from 135° to 225° . [19]

ASSESSMENT CRITERIA 2.2

1	CONSTRUCTION	5		
2	CAM PROFILE	13 $\frac{1}{2}$		
3	TYPE OF MOTION	1		
PENALTIES (-)				
SUBTOTAL 2.2		19 $\frac{1}{2}$		
SUBTOTAL 2.1		20 $\frac{1}{2}$		
TOTAL		40		

EXAMINATION NUMBER

EXAMINATION NUMBER

3

STAPLE

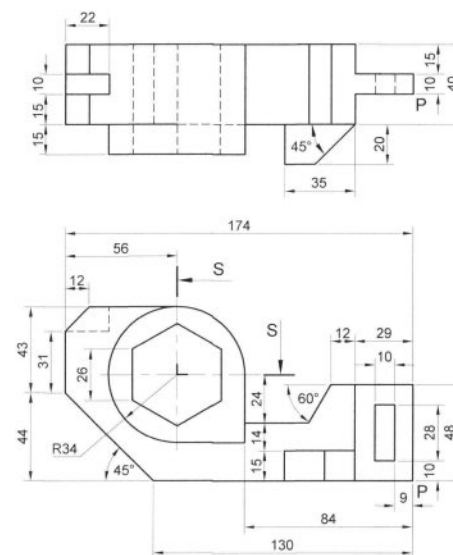
QUESTION 3: ISOMETRIC DRAWING**Given:**

- The front view and top view of a gauge block
- The position of point P on the drawing sheet

Instructions:

Using scale 1 : 1, convert the orthographic views of the gauge block into a sectional isometric drawing on cutting plane S-S.

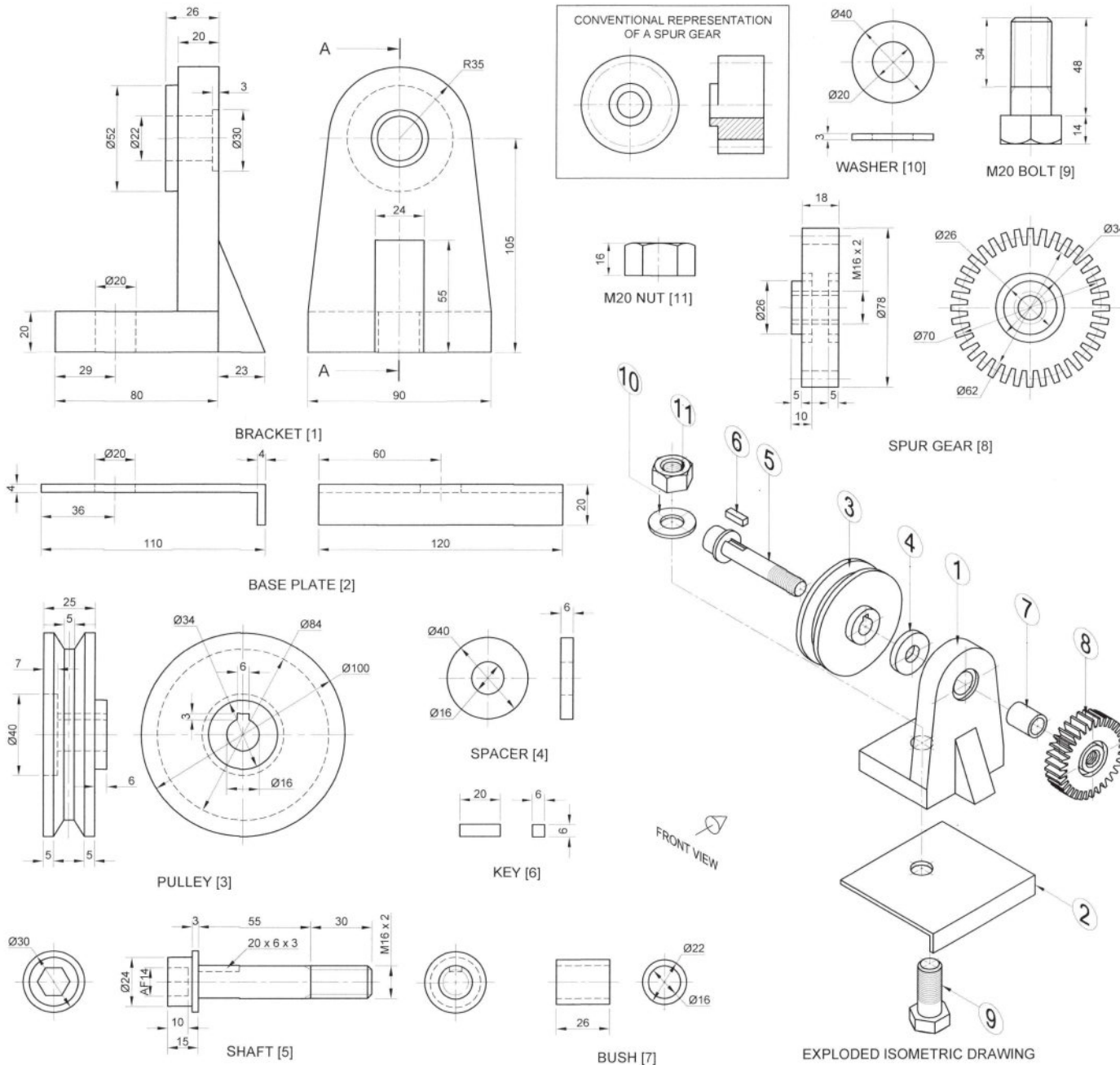
- Use P as the starting point and lowest point of the drawing.
- Show ALL construction.
- NO hidden detail is required.

[40]

P

ASSESSMENT CRITERIA

1	PLACING/ORIENTATION + AUX. VIEWS	2			
2	FRONT PORTION	16 $\frac{1}{2}$			
3	MIDDLE + REAR PORTION	7			
4	HEXAGON	4 $\frac{1}{2}$			
5	CIRCLE + CL	5			
6	SECTIONED SURFACE + HATCHING	5			
PENALTIES (-)					
TOTAL		40			
EXAMINATION NUMBER					
EXAMINATION NUMBER					4

**QUESTION 4: MECHANICAL ASSEMBLY****Given:**

- Orthographic views of each part of a drive shaft support assembly
- The exploded isometric drawing of the parts of the drive shaft support assembly, showing the position of each part relative to all the others
- A conventional representation of a spur gear

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 drive shaft support assembly:
 - A sectional front 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 right view of the bracket (part 1).
 - The right view**

NOTE:

- Planning is essential.
- ALL drawings must comply with the *SANS 10111* guidelines.
- The convention of symmetry may NOT be applied.
- Show THREE faces of the M20 nut (part 11) in the front view.
- Show TWO faces of the hexagonal hole in the head of the shaft (part 5) in the front view.
- Draw the spur gear (part 8) as a conventional representation.
- Add cutting plane A-A.
- NO hidden detail is required.

[90]**PARTS LIST**

NO.	PART	QUANTITY	MATERIAL
1	BRACKET	1	MILD STEEL
2	BASE PLATE	1	MILD STEEL
3	PULLEY	1	CAST IRON
4	SPACER	1	MILD STEEL
5	SHAFT	1	STAINLESS STEEL
6	KEY	1	MILD STEEL
7	BUSH	1	BRASS
8	SPUR GEAR	1	STAINLESS STEEL
9	M20 BOLT	1	MILD STEEL
10	Ø40 WASHER	1	SPRING STEEL
11	M20 NUT	1	MILD STEEL

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DRIVE SHAFT SUPPORT

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
1	BRACKET + BASE PLATE	5 $\frac{1}{2}$		
2	GEAR + CL	2		
3	PULLEY + SHAFT	2		
SUBTOTAL		9 $\frac{1}{2}$		
SECTIONAL FRONT VIEW				
1	BASE	4		
2	BRACKET + RIB	10 $\frac{1}{2}$		
3	PULLEY	10		
4	SHAFT	11		
5	BUSH + KEY + SPACER	6 $\frac{1}{2}$		
6	SPUR GEAR	11		
7	M20 NUT + WASHER	5		
8	M20 BOLT	7 $\frac{1}{2}$		
SUBTOTAL		65 $\frac{1}{2}$		
GENERAL				
1	CENTRE LINES	2		
2	CUTTING PLANE	3		
3	ASSEMBLY	10		
SUBTOTAL		15		
TOTAL		90		
PENALTIES (-)				
GRAND TOTAL				
EXAMINATION NUMBER				
EXAMINATION NUMBER				6