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NATIONAL
SENIOR CERTIFICATE

GRADE 12



ENGINEERING GRAPHICS AND DESIGN P2

SEPTEMBER 2019

PREPARATORY EXAMINATION

MARKS: 200

TIME: 3 hours

This question paper consists of 6 pages.

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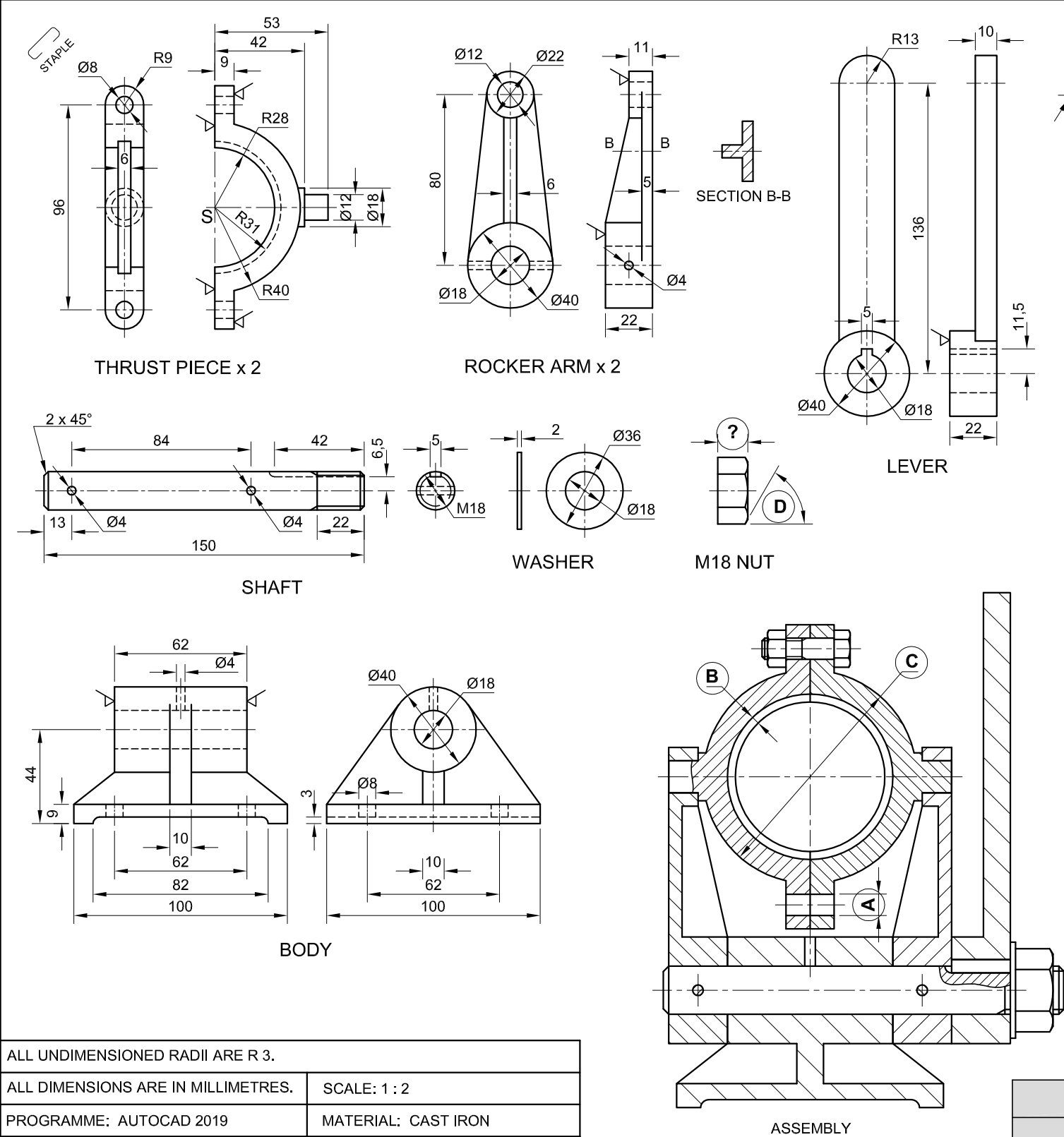
INSTRUCTIONS AND INFORMATION

1. The paper consists of FOUR questions.
2. Answer ALL the questions.
3. ALL drawings must be drawn to scale 1 : 1, unless otherwise stated.
4. 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.

FOR OFFICIAL USE ONLY									
								MODERATED MARK	
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TOTAL									
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COMPLETE THE FOLLOWING:	
NAME	
NAME	
EXAMINATION CENTRE	
EXAMINATION CENTRE	



QUESTION 1: ANALYTICAL (MECHANICAL)

Given:
A detailed drawing of a rocking lever, a title block, assembled front view and a table of questions. The drawings have not been prepared to the indicated scale.

Instructions:
Complete the table below by neatly answering the questions, which all refer to the accompanying drawings and the title block. [25]

QUESTIONS		ANSWERS	
1	Who approved the drawing?	1	
2	In which town is the engineering firm situated?	1	
3	Which indicated scale has been used?	1	
4	What type of material is used for the rocking arm?	1	
5	What finish is required on the rocking lever?	1	
6	What is the drawing number?	1	
7	What roughness value is required on the machined surfaces?	1	
8	Determine the following dimensions: A) B) C) D)	4	
9	Determine the thickness of the M18 nut.	1	
10	Name the type of section the cutting plane B-B produced.	1	
11	What is the depth of the key way on the shaft?	1	
12	How many surfaces, on the THRUST PIECES, need to be machined?	1	
13	What is the total height of the assembly?	1	
14	What is the purpose of the washer?	2	
15	Insert the vertical cutting plane A-A on the correct view of the BODY.	3	
16	In the box below, draw, in neat freehand, the SANS symbol for the projection symbol used.	4	
TOTAL		25	



⊕_A

QUESTION 2.1: LOCI

Given:

- A schematic diagram of a mechanism consisting of crank AB, sliding rod BC, connecting rod DE, crank EF and horizontal groove HJ
- The position of centre point A on the drawing sheet

Specifications:

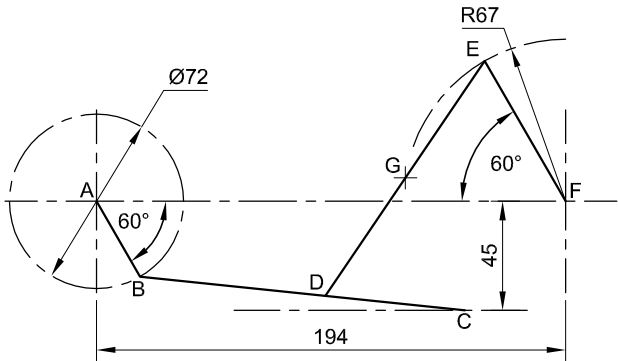
- The positions of centre points A and F and groove HJ are fixed
- Sliding rod BC is pin-jointed to crank AB and connecting rod DE is pin-jointed to crank EF
- Connecting rod DE is pin jointed to sliding rod BC at D
- BC is 135 mm long, CD is 58 mm and point G is in the centre of DE.

Motion:

As crank AB rotates in a clockwise direction, point C, of sliding rod BC, reciprocates along groove HJ.

Instructions:

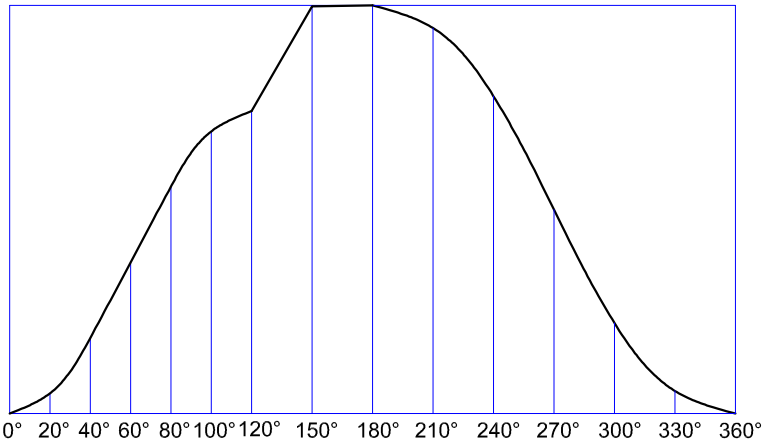
- Draw, to scale 1 : 1, the given schematic drawing of the mechanism.
- Trace the loci generated by point D and by point G for one complete rotation of crank AB.



Show ALL construction.

[25]

ASSESSMENT CRITERIA					
1	GIVEN	6			
2	CONSTRUCTION	6			
3	LOCI POINTS	11			
4	CURVE + QUALITY	2			
TOTAL		25			



DISPLACEMENT GRAPH
SCALE 96 mm = 360°

2.2 Given:

A displacement graph showing simple harmonic motion, uniform motion and uniform acceleration and retardation.

Instructions:

Draw a cam profile from the given graph to comply with the following specifications:

- Camshaft diameter = 10 mm
- Minimum distance from profile to the centre of the cam shaft = 8 mm
- Rotation = clockwise

Add centre lines and the arrow of rotation to the cam.

Show ALL constructions.

[17]

ASSESSMENT CRITERIA					
1	CONSTRUCTION	4			
2	SHAFT + ARROW + CL	3 ½			
3	CAM POINTS	7			
4	CURVE + QUALITY	2 ½			
SUB-TOTAL 2.2		17			
SUB-TOTAL 2.1		25			
TOTAL		42			
NAME					
NAME					3



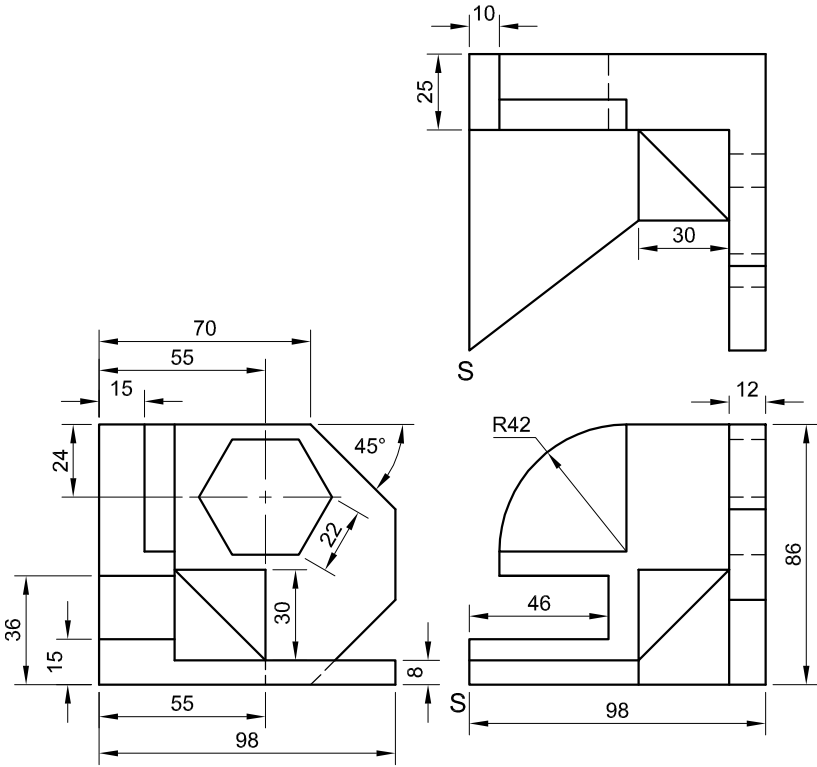
QUESTION 3: ISOMETRIC DRAWING

Given:
The front view, top view and left view of a jig bracket.
The position of point S on the drawing sheet.

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

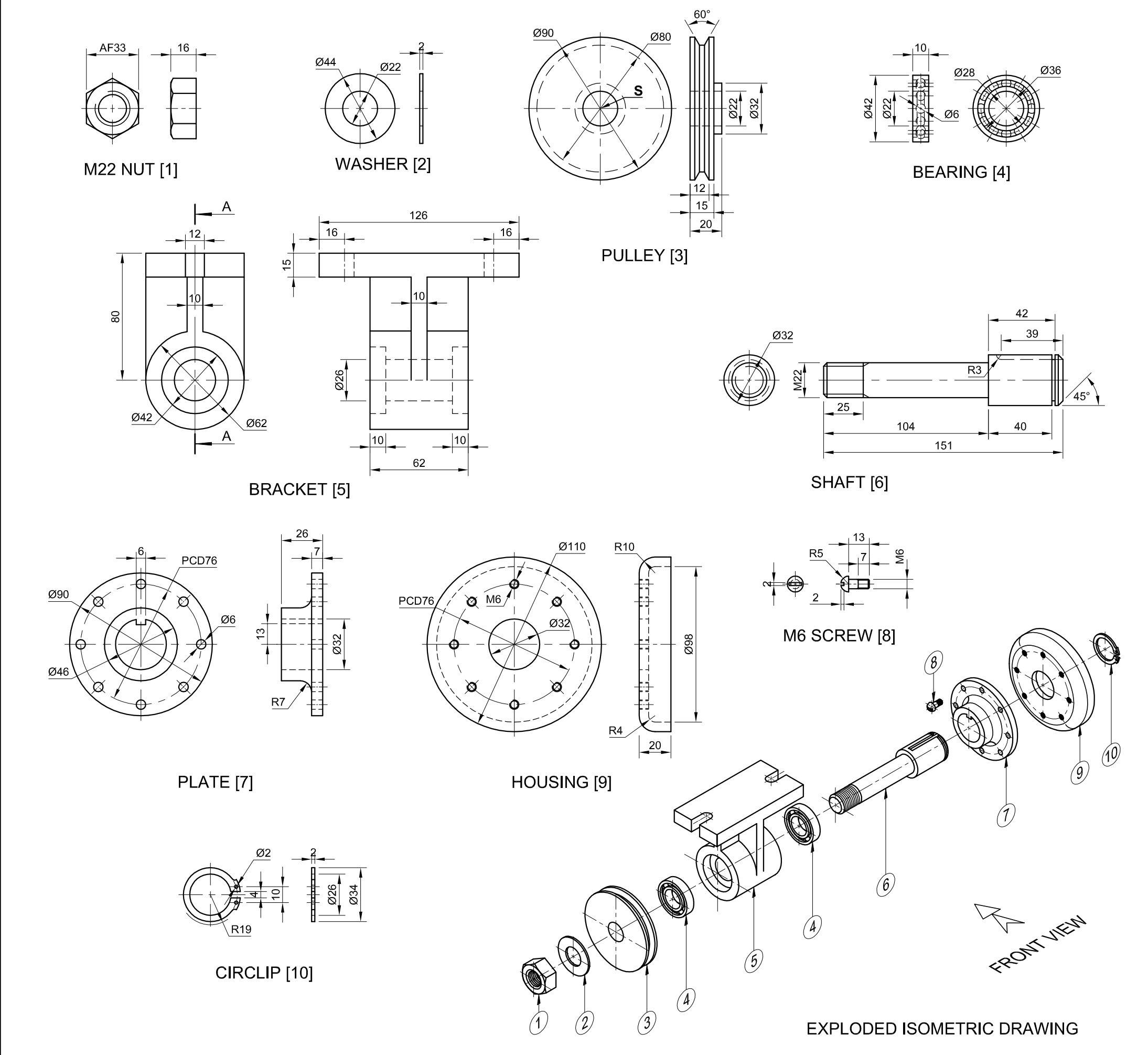
- Make corner S the lowest point of the drawing.
- Show ALL construction.
- NO hidden detail is required.

[35]



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S

ASSESSMENT CRITERIA					
1	AUX' VIEW + PLACING	3			
2	ISOMETRIC LINES	17 ¹ / ₂			
3	HEXAGON + 45°	11 ¹ / ₂			
4	CIRCLE	3			
TOTAL		35			
NAME					
NAME					4



QUESTION 4: MECHANICAL ASSEMBLY

- Given:**
- The exploded isometric drawing of the parts of a pulley assembly, showing the position of each part relative to all the others.
 - Orthographic views of each of the parts of the pulley assembly.
 - Starting point S on 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 pulley assembly:
 - 4.1 The sectional front view** of the pulley assembly, on cutting plane A-A as seen from the direction of the arrow shown on the exploded isometric drawing. The cutting plane, that runs vertically through the centre of the assembly, is shown on the left view of the bracket (part 5).
 - 4.2 A left view** without any hidden detail.
 - ALL drawings must comply with the guidelines contained in the *SANS 10111*.

- NOTE:**
- Only show the top M6 screw in position.
 - Planning of the layout of the views is important.
 - Show, in the sectional front view, THREE faces of the M22 nut and ALL constructions.
 - NO hidden detail is required.

- Add the following features to the drawing:**
- The cutting plane A-A. [98]

PARTS LIST		
PARTS	QUANTITY	MATERIAL
1. M22 NUT	1	MILD STEEL
2. WASHER	1	MILD STEEL
3. PULLEY	1	CAST IRON
4. BEARINGS	2	MILD STEEL
5. BRACKET	1	CAST IRON
6. SHAFT	1	MILD STEEL
7. PLATE	1	CAST IRON
8. M6 SCREW	8	MILD STEEL
9. HOUSING	1	CAST IRON
10. CIRCLIP	1	SPRING STEEL

TITLE		OVERHEAD PULLEY	
MILLS		10 PETER STREET	
ENGINEERING WORKS		UITENHAGE	
		6001	
		041 123 9876	
ALL DIMENSIONS ARE IN MILLIMETRES.	ALL UNSPECIFIED RADII ARE R4.		5



+s

ASSESSMENT CRITERIA					
SECTIONAL FRONT VIEW					
1	BRACKET	16			
2	BEARINGS	4			
3	SHAFT	13			
4	PULLEY	8½			
5	NUT + WASHER	7			
6	PLATE	10			
7	SCREW	8			
8	CIRCLIP	3½			
9	HOUSING	9			
SUB-TOTAL		79			
ASSESSMENT CRITERIA					
LEFT VIEW					
1	BRACKET	4			
2	HOUSING + PULLEY + CL	2½			
3	NUT & WASHER	5			
4	CUTTING PLANE	3			
5	ASSEMBLY	4½			
SUB-TOTAL		19			
TOTAL		98			
NAME					
NAME					6