STAPLE

basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE/
NATIONAL SENIOR CERTIFICATE

GRADE 12

ENGINEERING GRAPHICS AND DESIGN P2

NOVEMBER 2020

MARKS: 100

TIME: 3 hours

This question paper consists of 6 pages.

Barcode label

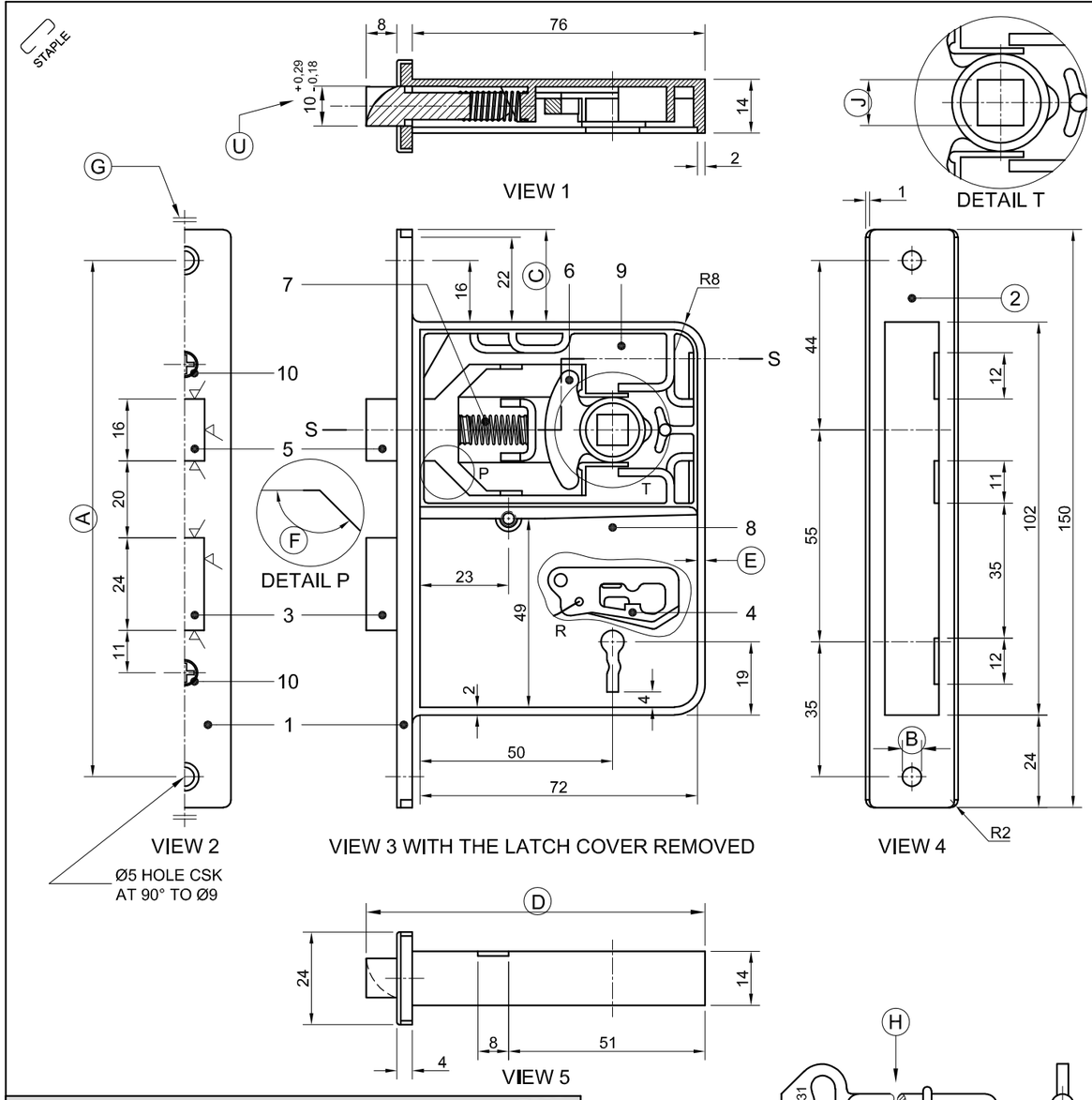
INSTRUCTIONS AND INFORMATION

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			½	SIGN	MODERATED			½	SIGN	RE-MARKING			½	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



PARTS LIST			
	PART	QUANTITY	MATERIAL
1	FACE PLATE	1	METAL
2	LOCK BODY	1	PLASTIC
3	BOLT LOCK	1	PEWTER
4	LEVER LOCK	2	METAL
5	LATCH	1	PEWTER
6	LATCH TRIGGER	1	PLASTIC
7	SPRING	1	SPRING STEEL
8	BOLT COVER	1	PLASTIC
9	LATCH COVER	1	PERSPEX
10	SCREW	3	METAL

DRAWING PROGRAM: CAD	SCALE 1 : 1	MANUFACTURING PROCESSES: - PLATE BENDING - INJECTION MOULDING - MILLING
APPROVED: ANDY	DATE: 2018/09/14	
CHECKED: JOHN	DATE: 2018/08/31	
DRAWN: SIPO	DATE: 2018/08/30	DRAWING NR: DL 04
TOP LOCK COMPANY		SAFETY & SECURITY SHOP 2 MORTICE ROAD www.lockcompany.co.za
TITLE **TWO-LEVER DOOR LOCK**		

QUESTION 1: ANALYTICAL (MECHANICAL)

Given:
Five views of a door lock, two detailed enlargements, two views of a key, a parts list, a title block and a table of questions. The drawing has not been prepared 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]**

	QUESTION	ANSWER			
1	What is the title of the drawing?		1		
2	Who prepared the drawing?		1		
3	On what date was the drawing approved?		1		
4	What is the drawing number?		1		
5	How many manufacturing processes are required?		1		
6	How many parts make up the door lock?		1		
7	What material is used to manufacture the latch cover?		1		
8	What is VIEW 5 called?		1		
9	Determine the complete dimensions at A: B: C: D: E:		5		
10	Measure the angle at F.		1		
11	Name the convention at G.		1		
12	What type of view is produced by the S-breaks at H?		1		
13	What type of section is produced by cutting plane S-S?		1		
14	Insert the arrows for cutting plane S-S on the drawing.		2		
15	If the square in DETAIL T is 9 x 9 mm, show the alternative method of showing the dimension of 9 x 9 at J.		1		
16	How many flat surfaces must be machined?		1		
17	Name the direction of lay that must be applied to machined surfaces.		1		
18	With reference to the tolerance, determine the maximum dimension at U.		2		
19	In the space below (ANSWER 19), draw, in neat freehand, the conventional representation of a coil spring.		3		
20	In the space below (ANSWER 20), draw, in neat freehand, the symbol for the projection system used.		3		
		TOTAL	**30**		

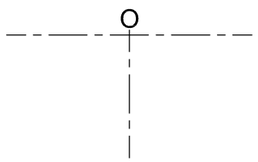
ANSWER 19: Conventional representation for a coil spring

ANSWER 20: Projection symbol

EXAMINATION NUMBER

EXAMINATION NUMBER 2

STAPLE

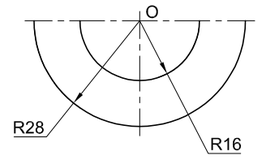


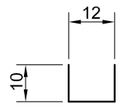
QUESTION 2: LOCI

NOTE: Answer QUESTION 2.1 and 2.2.

2.1 HELIX

Given:
- An auxiliary view and the profile of a chute that does not have a core
- The position of centre point O on the drawing sheet





CHUTE PROFILE

Specifications:
- Starting position: Bottom right
- Pitch: 60 mm
- Turns: ONE
- Direction: Lefthanded

Instructions:
Draw, to scale 1 : 1, the following views of the chute:
2.1.1 The given auxiliary view
2.1.2 The complete front view

- Show ALL construction.
- NO hidden detail is required. **[22]**

ASSESSMENT CRITERIA 2.1					
1	GIVEN	1			
2	CONSTRUCTION	6			
3	HELIX + CL	13			
4	CURVE QUALITY	2			
PENALTY (-)					
SUBTOTAL		**22**			

2.2 CAM

Given:
The starting position (0°) of the displacement graph on the drawing sheet

Motion:
A cam rotates at constant velocity imparting the following motion to the follower:
- There is a dwell period for the first 45°
- It descends 44 mm with uniform motion over the next 45°
- It descends 24 mm with simple harmonic motion over the next 90°
- It rises 42 mm with uniform acceleration and retardation over the next 90°
- It returns with uniform motion to the original position over the rest of the rotation

Instructions:
Draw, to a rotational scale of 120 mm = 360° and a displacement scale of 1 : 1, the complete displacement graph for the required motion.

- Label the graph and indicate the rotational scale.
- Show ALL construction. **[15]**

ASSESSMENT CRITERIA 2.2					
1	CONSTRUCTION	6			
2	POINTS + CURVES	9			
PENALTIES (-)					
SUBTOTAL 2.2		**15**			
SUBTOTAL 2.1		**22**			
TOTAL		**37**			

EXAMINATION NUMBER

EXAMINATION NUMBER 3

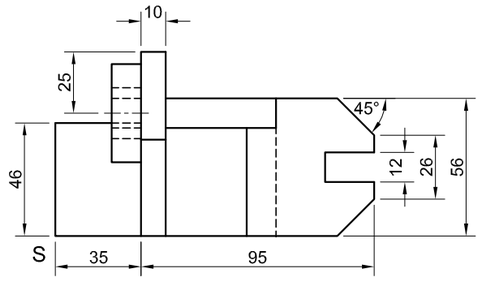
STAPLE

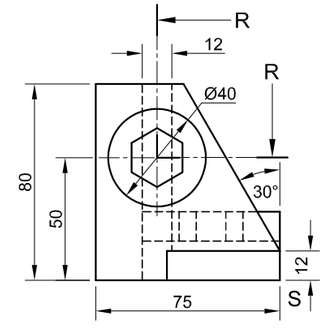
QUESTION 3: ISOMETRIC DRAWING

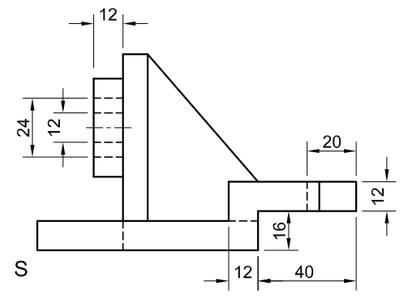
Given:
- The front view, top view and left view of a jig
- The position of point S on the drawing sheet

Instructions:
Using scale 1 : 1, convert the orthographic views of the jig into a sectional isometric drawing on cutting plane R-R.

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





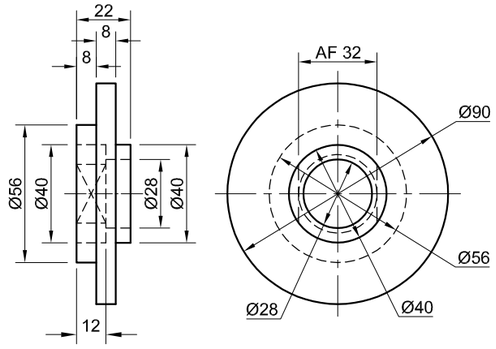


S

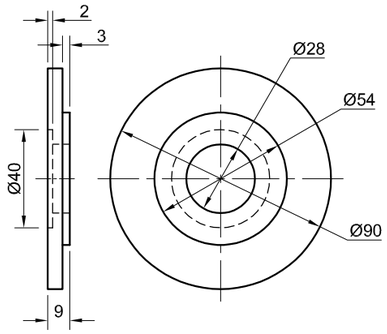
ASSESSMENT CRITERIA						
1	PLACEMENT + AUX VIEW	3				
2	BASE	13				
3	UPRIGHT	$4\frac{1}{2}$				
4	CIRCLE + HEZAGON	$9\frac{1}{2}$				
5	SECTION	10				
PENALTIES (-)						
	TOTAL	**40**				

EXAMINATION NUMBER

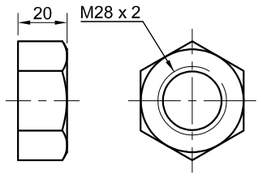
EXAMINATION NUMBER



INNER FLANGE [3]

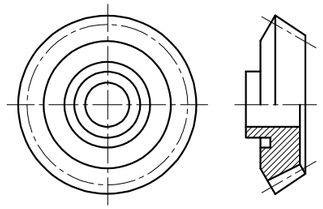


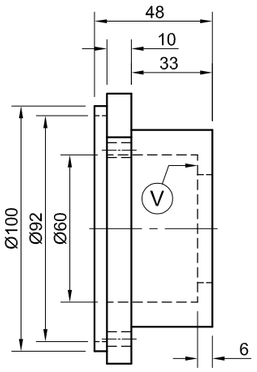
OUTER FLANGE [2]

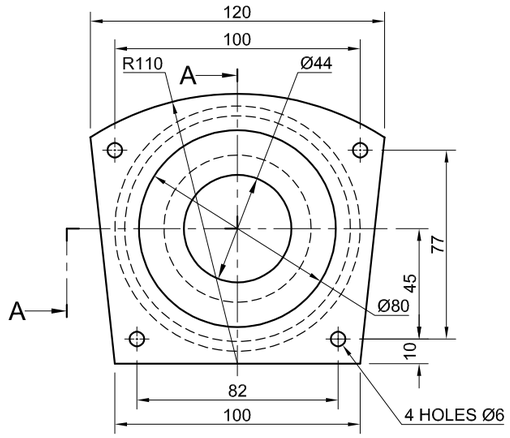


M28 NUT [1]

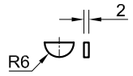
AN EXAMPLE OF THE CONVENTIONAL REPRESENTATION OF A BEVEL GEAR



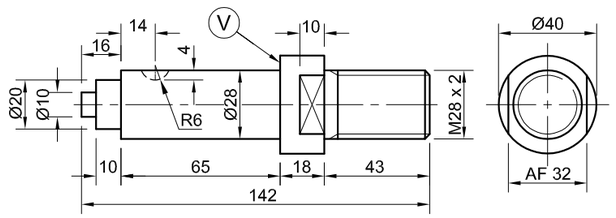




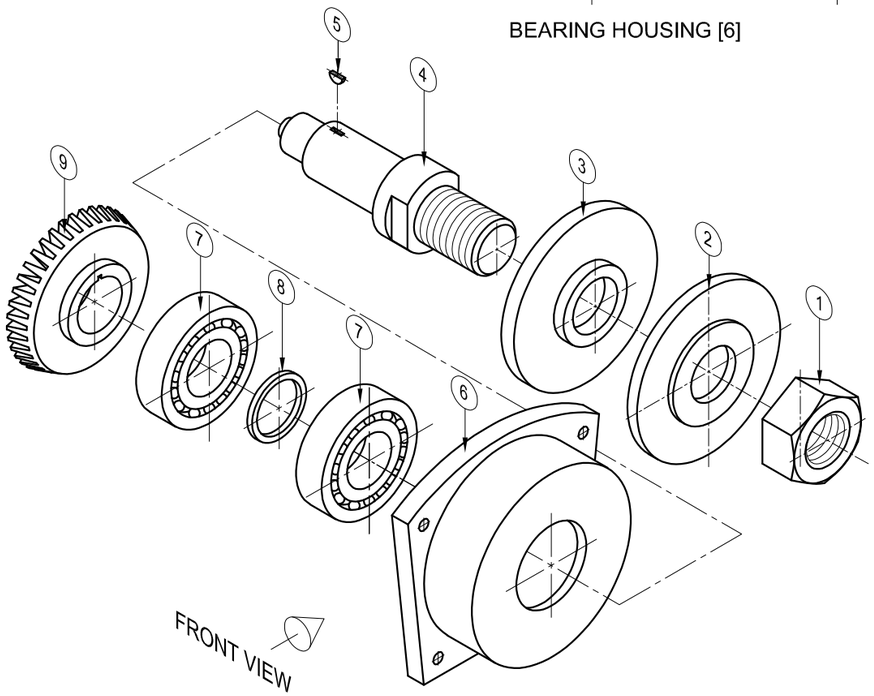
BEARING HOUSING [6]



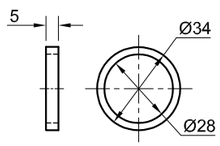
WOODRUFF KEY [5]



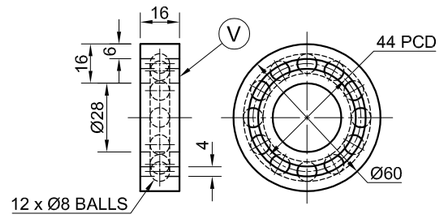
SHAFT [4]



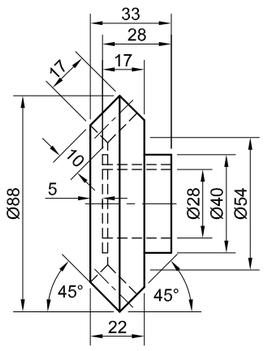
EXPLODED ISOMETRIC DRAWING



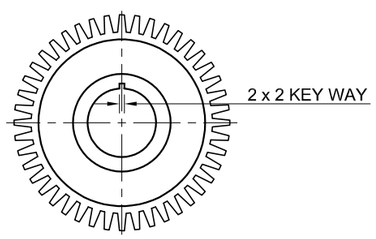
SPACER [8]



BEARING [7]



BEVEL GEAR [9]



QUESTION 4: MECHANICAL ASSEMBLY

Given:

- The exploded isometric drawing of the parts of a shaft assembly, showing the position of each part relative to all the others
- Orthographic views of each part of the shaft assembly
- An example of the conventional representation of a bevel 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 shaft assembly:
  - 4.1 **A half-sectional front view** on cutting plane A-A. Show the top half in section, as seen from the direction of the arrow on the exploded isometric drawing. The cutting plane is shown on the right view of the bearing housing (part 6).
  - 4.2 **The right view**

NOTE:

- Planning is essential.
- The drawing must comply with the guidelines as contained in the *SANS 10111.*
- The convention of symmetry may NOT be applied.
- The surfaces marked **V** on the shaft (part 4) and the right bearing (part 7), must be aligned with the surface marked **V** on the inside of bearing housing (part 6).
- Show THREE faces of the M28 nut (part 1) in the half-sectional front view.
- Draw the **left** bearing in detail and the **right** bearing as a convention representation.
- Add cutting plane A-A.
- NO hidden detail is required. **[93]**

PARTS LIST

	PART	QUANTITY	MATERIAL
1	M28 NUT	1	MILD STEEL
2	OUTER FLANGE	1	MILD STEEL
3	INNER FLANGE	1	MILD STEEL
4	SHAFT	1	TOOL STEEL
5	WOODRUFF KEY	1	TOOL STEEL
6	BEARING HOUSING	1	PEWTER
7	BEARING	2	TOOL STEEL
8	SPACER	1	MILD STEEL
9	BEVEL GEAR	1	TOOL STEEL

GSP
SHAFTS AND GEARS

CYLINDER STREET
INDUSTRIAL PARK
www.shaftsgalore.co.za

SHAFT ASSEMBLY

ALL DIMENSIONS ARE IN MILLIMETRES

Please turn over

STAPLE

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	BODY	$4\frac{1}{2}$			
2	SHAFT	$1\frac{1}{2}$			
3	M28 NUT + FLANGE	$3\frac{1}{2}$			
SUBTOTAL		**$9\frac{1}{2}$**			
HALF SECTIONAL FRONT VIEW					
1	BODY	13			
2	SHAFT + KEY	16			
3	BEARING + SPACER	9			
4	FLANGES	13			
5	M28 NUT	$4\frac{1}{2}$			
6	GEAR	11			
SUBTOTAL		**$66\frac{1}{2}$**			
GENERAL					
1	CENTRE LINES	4			
2	CUTTING PLANE A-A	4			
3	ASSEMBLY	9			
SUBTOTAL		**17**			
TOTAL		**93**			
PENALTIES (-)					
GRAND TOTAL					

EXAMINATION NUMBER

EXAMINATION NUMBER 6