



eduresourceza.com



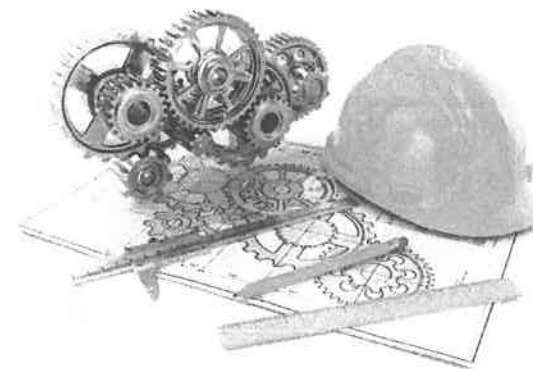
NATIONAL SENIOR CERTIFICATE EXAMINATION

2019

ENGINEERING GRAPHICS AND DESIGN

PAPER 2

MARKS: 200
TIME: 3 HOURS



FOR OFFICIAL USE ONLY

QUESTION	SECTION	MARK	MODERATED	MAXIMUM	CODE
1	MECHANICAL ANALYTICAL			20	
2	LOCI CAM			40	
3	ISOMETRIC DRAWING			40	
4	MECHANICAL ASSEMBLY			100	
	TOTAL			200	

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

This question paper consists of **6 pages**, including the cover page and **4 questions**.

All questions must be answered.

Unless specified otherwise, all questions are in **third-angle orthographic projection**.

Unless specified otherwise, all questions are to be completed to a **scale of 1:1**.

All answer sheets must be re-stapled in numerical order and handed in, even unanswered questions.

All construction work must be shown, even if a **stencil** was used.

Print your **examination number** neatly on each page.

Use only the **answer sheets** provided.

Your drawings should be **well presented** and reflect **neatness** and **accuracy**. Marks will be **deducted** for untidy and inaccurate work.

1. All dimensions or detail not given may be **assumed** in **good proportion**.

1. **Stencils** and **calculators** may be used.

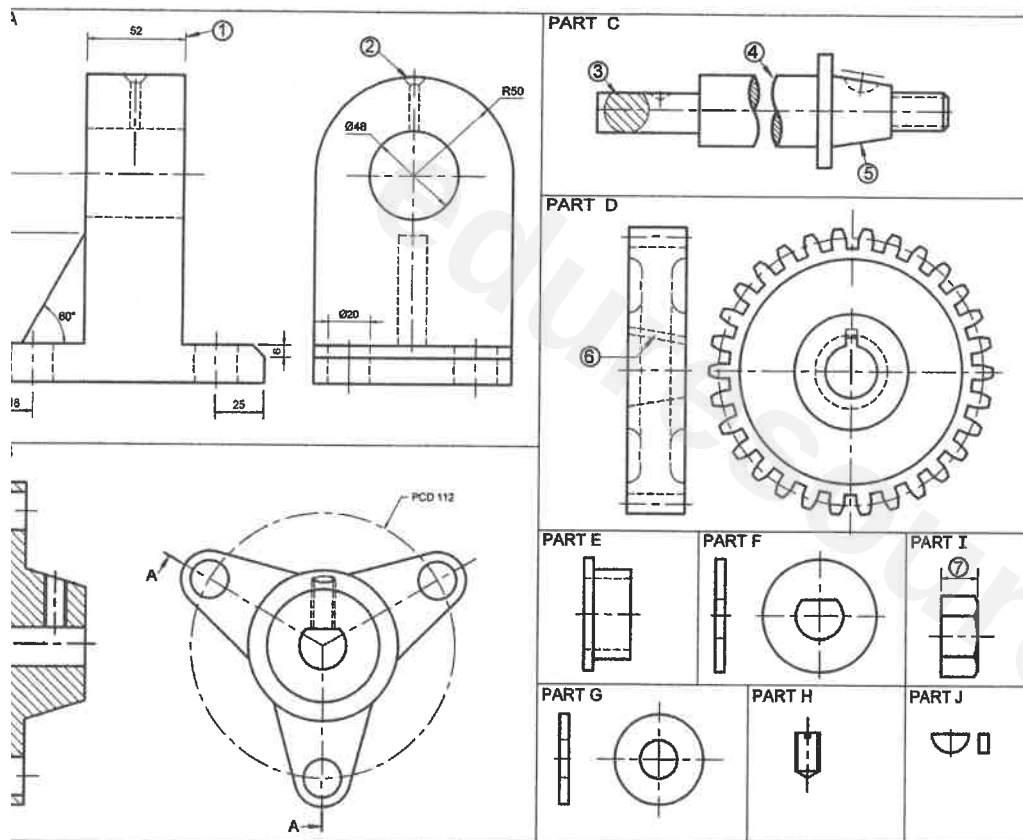
1. **All** drawings must adhere to the SANS 10111-1.

1. In order to save time, **detailed assembly parts** must be **drawn to convention**.

EXAMINATION NUMBER

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

QUESTION

MECHANIC/
ANALYTICAL

STUDY THE ADJACENT DRAWING AND ANSWER THE QUESTIONS THAT FOLLOW:

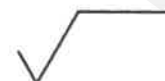
- 1.1 What does the abbreviation "NTS" stand for? (1)
- 1.2 What does the abbreviation "PCD" stand for? (1)
- 1.3 Name the part that is manufactured from key steel? (1)
- 1.4 What is the tolerance on all dimensions? (1)
- 1.5 What are the maximum and minimum dimensions tolerated at 1 in Part A? (2)
- 1.6 What type of hole is shown at 2 in Part A? (1)
- 1.7 Name the type of sectioning at 3 in Part C. (1)
- 1.8 What is feature 4 in Part C called? (1)
- 1.9 What is feature 5 in Part C called? (1)
- 1.10 What is feature 6 in Part D called? (1)
- 1.11 Calculate the exact dimension at 7 in Part I. (1)
- 1.12 Name the type of sectioning in Part B. (1)
- 1.13 What is the total height of Part A? (1)
- 1.14 Which part prevents the coupling from sliding on the shaft? (1)
- 1.15 In the space below, complete in freehand, the welding symbol indicating a square weld on site.

WELDING SYMBOL



- 1.16 In the space below, complete the machining symbol indicating a perpendicular direction of lay using a grinding method to a surface roughness value of 0.2.

MACHINING SYMBOL

**MSMZ ENGINEERING**

DESIGN / MANUFACTURE / ENGINEERING.

INDUSTRIAL PARK
IND
IZABETH
TEL: 042 5551234
FAX: 042 5551235
CELL: 093 5551235
www.msmzl.co.za
info@msmzl.co.za

DESIGNED BY: P SWART
DRAWN BY: FREDDIE TSHABALALA
CHECKED BY: LEONARD MEYER
DATE: 14 JULY 2019
BY: DEAN SING

TITLE:
**INTERMEDIATE
SHAFT AND GEAR**

SCALE: NTS

SPECIFIED RADII ARE R3.
TOLERANCES ON ALL DIMENSIONS ARE: $\pm 0,25$

PARTS LIST

NO	PART	QUANTITY	MATERIAL
A	HOUSING	1	CAST IRON
B	COUPLING	1	CAST IRON
C	SHAFT	1	MILD STEEL
D	GEAR	1	STEEL
E	BUSH	2	PHOSPHOR BRONZE
F	SPACER	1	PHOSPHOR BRONZE
G	WASHER	1	MILD STEEL
H	M12 GRUB SCREW	1	MILD STEEL
I	M20 HEXAGONAL NUT	1	MILD STEEL
J	WOODRUFF KEY	1	KEY STEEL

20 MARKS

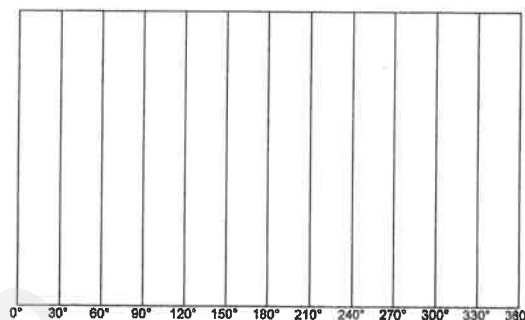
EXAMINATION NUMBER

ANSWER SHEET 1

QUESTION

LOC
CAM

A



The drawings show the following:

- an incomplete **graph of displacement** in position of a **roller-ended follower**.
- the centre lines of a camshaft.
- the shaft and follower detail at the starting position.

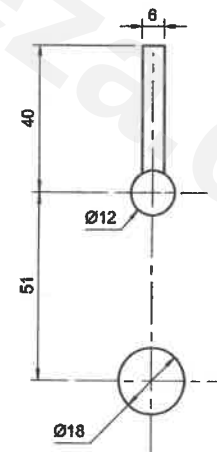
The cam imparts the following motion to the follower:

- $0^\circ - 60^\circ$ the follower is at **rest**.
- $60^\circ - 120^\circ$ the follower **rises** 28 mm with **uniform motion**.
- $120^\circ - 165^\circ$ the follower is at **rest**.
- $165^\circ - 255^\circ$ the follower **falls** 56 mm with **simple harmonic motion**.
- $255^\circ - 300^\circ$ the follower is at **rest**.
- $300^\circ - 360^\circ$ the follower **returns** to its original position with **uniform motion**.

The cam profile has the following specifications:

- The direction of turn is **clockwise**.
- The **camshaft** has a diameter of 18 mm.

- 2.1 Draw and hatch the camshaft.
- 2.2 Draw the roller-ended follower to specification.
- 2.3 Draw the complete graph of displacement.
- 2.4 Draw the direction of rotation.
- 2.5 Draw and label all the divisions on the cam profile.
- 2.6 Draw the cam profile from the displacement graph.
- 2.7 Label the graph of displacement at A.
- 2.8 Show all constructions.



ASSESSMENT CRITERIA

• Graph & Label	15
• Plot Points	16
• Locus & Construction	4
• Shaft and Hatching	2
• Direction & Divisions	2
• Follower	1

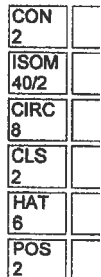
GRPH	15
PTS	16
LOC	4
SHIFT	2
DIR	2
FOL	1

40 MARKS

EXAMINATION NUMBER

ANSWER SHEET 2

- 3.1 Draw a neat **full-sectioned Isometric** drawing on **cutting-plane A-A**.
- 3.2 Show the construction for the square and any other auxiliary views.
- 3.3 Draw the centre lines for the circle.
- 3.4 Make point **P** the lowest part of your drawing.
- 3.5 Start your drawing on the given crosshairs.

40 MARKS

ANSWER SHEET 3

IT © 2019

A	HOUSING	11
B	COUPLING	8
C	SHAFT	8
D	GEAR	6
E	BUSHES	6
F	SPACER	2
G	WASHER	2
H	M12 SCREW	2
I	M16 NUT	6
J	KEY	1
TOTAL		52

A	HOUSING	7	
C	SHAFT	2	
D	GEAR	2	
G	WASHER	1	
I	M16 NUT	2	
HIDDEN DETAIL 12/2		6	
TOTAL		20	

CORRECT ASS.	3
HATCHING 14/2	7
NON-HATCHING 4/2	2
CENTRE LINES 8/2	4
DIMENSIONS	3
CUTTING PLANE 8/2	4
SYMBOL	2
TITLE/SCALE/LABEL	3
TOTAL	28
TOTAL	100

.E:

SYMBOL:

ANSWER SHEET 4

EXAMINATION NUMBER