



NATIONAL SENIOR CERTIFICATE EXAMINATION SUPPLEMENTARY PAPER

2019

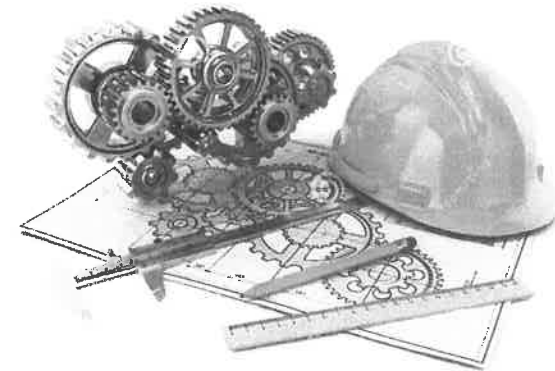
ENGINEERING GRAPHICS AND DESIGN

PAPER 2

MARKS: 200
TIME: 3 HOURS

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

1. This question paper consists of 6 pages, including the cover page and 4 questions.
2. **All** questions must be answered.
3. Unless specified otherwise, all questions are in **Third-Angle Orthographic Projection**.
4. Unless specified otherwise, all questions are to be completed to a **scale of 1:1**.
5. **All** answer sheets must be re-stapled in numerical order, and handed in, even attempted/blank questions.
6. All **construction work** must be shown, even if a **stencil** was used.
7. Print your **examination number** neatly on each page.
8. Use only the answer **sheets** provided.
9. Your drawings should be **well presented** and reflect **neatness** and **accuracy**. Marks will be **deducted** for untidy and inaccurate work.
10. All dimensions or detail not given may be **assumed** in **good proportion**.
11. **Stencils** and **calculators** may be used.
12. **All** drawings must adhere to the SANS 10111-1.
13. In order to save time, detailed assembly parts must be drawn to convention.



FOR OFFICIAL USE ONLY

QUESTION	SECTION	MARK	MODERATED	MAXIMUM	CODE
1	MECHANICAL ANALYTICAL			20	
2	LOC1 CAM			40	
3	ISOMETRIC DRAWING			40	
4	MECHANICAL ASSEMBLY			100	
SYMBOL	TOTAL			200	
	TOTAL			100	

FINAL CONVERTED MARK

100

CHECKED BY

EXAMINATION NUMBER

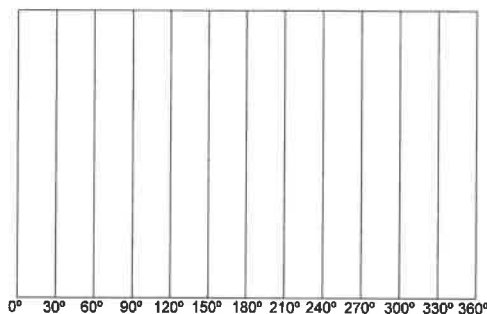
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PLEASE TURN OVER

QUESTION 2

LOCI
CAM

A



B

The incomplete **graph of displacement** of a **wedge-ended** follower as well as the centre of the camshaft, as shown by the given centre lines, are given on the left.

The cam imparts the following motion to the follower:

- 0°–60° the follower **rises** 18 mm with **uniform motion**.
- 60°–120° the follower is at **rest**.
- 120°–240° the follower **rises** 36 mm with **uniform acceleration and retardation**.
- 240°–360° the follower returns to its original position with **simple harmonic motion**.

The cam profile has the following specifications:

- The direction of rotation is **anti-clockwise**.
- The **camshaft** has a diameter of 20 mm.

- 2.1 Draw the complete graph of displacement.
- 2.2 Draw the cam profile from the displacement graph.
- 2.3 Draw and hatch the camshaft.
- 2.4 Draw the wedge-ended follower (to your own appropriate size and measurements).
- 2.5 Draw the direction of rotation.
- 2.6 Print, in capitals, the required **labels** for the graph of displacement at **A** and the horizontal scale at **B**.
- 2.7 Show all constructions.
- 2.8 Draw and label all the divisions on the cam profile.

ASSESSMENT CRITERIA

- | | |
|---------------------------------|----|
| • Graph | 16 |
| • Plot Points | 12 |
| • Locus | 3 |
| • Shaft and Hatching | 2 |
| • Direction | 1 |
| • Follower | 1 |
| • Labels, constructions & scale | 5 |

GRPH	16	
PTS	12	
LOC	3	
SHFT	2	
DIR	1	
FOL	1	
LBS	5	

40 MARKS

EXAMINATION NUMBER

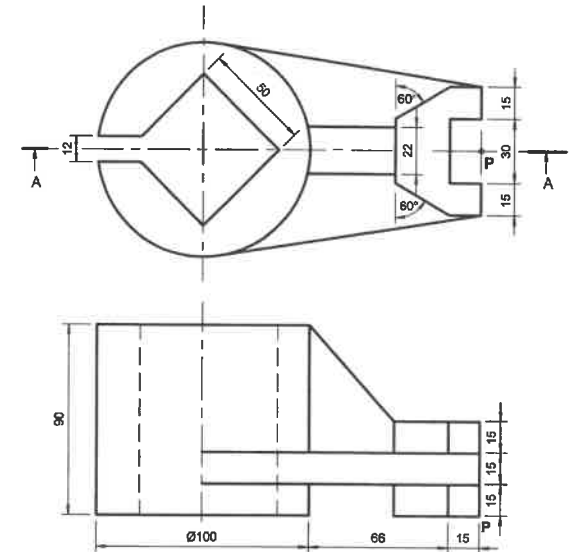
ANSWER SHEET 2

QUESTION 3

ISOMETRIC
DRAWING

The figure below shows the front view and top view of a heavy duty **CASTING**. The **CASTING** is cut by **cutting-plane A-A**.

- 3.1 Draw a neat **full sectioned isometric** drawing on **cutting-plane A-A**.
- 3.2 Show the construction for the hexagonal feature and the square.
- 3.3 Draw the centre lines for the circle.
- 3.4 Make point P the starting point of your drawing.



CONSTRUCTION AREA

P

ASSESSMENT CRITERIA

- | | |
|---------------------------|----|
| • Constructions | 2 |
| • Isometric Points | 30 |
| • Isometric Circles | 3 |
| • Centre Lines 2/2 | 1 |
| • Hatching / Non-hatching | 4 |

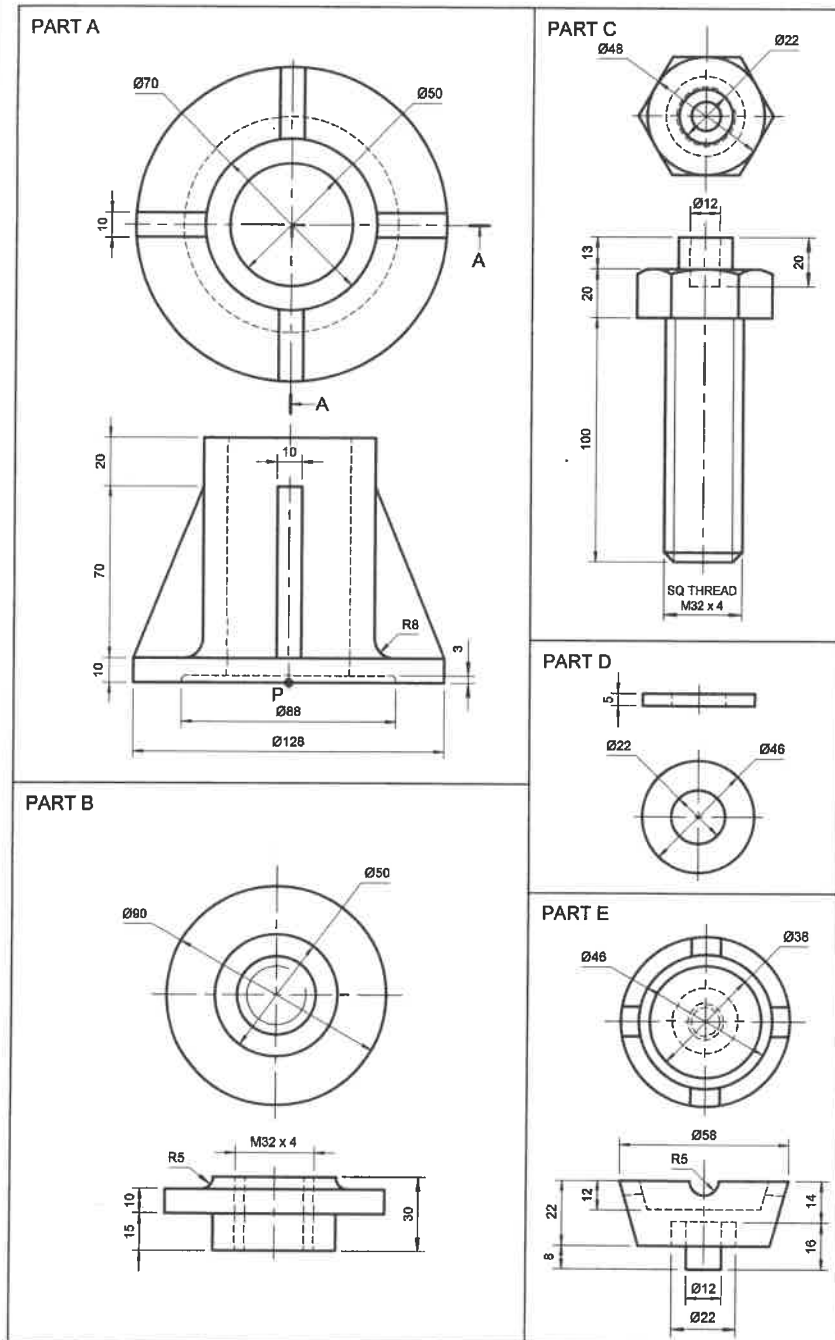
CON	2
ISOM	30
CIRC	3
CLS	2/2
HAT	4

40 MARKS

EXAMINATION NUMBER

ANSWER SHEET 3

FIGURE 1



EXPLODED FRONT VIEW

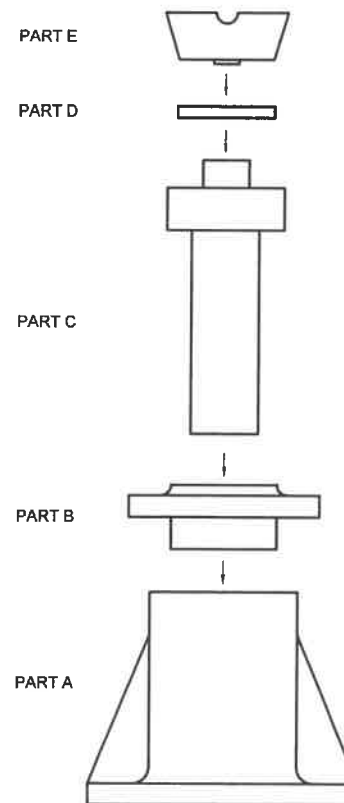


FIGURE 2



QUESTION 4
MECHANICAL ASSEMBLY

Figure 1 shows the different components (not to scale) for a **SCREW JACK** that needs to be assembled.

Figure 2 shows a picture of a similar **SCREW JACK**.

The **exploded front view** of how the components are assembled is also shown.

Complete the following on Answer Sheet 4 to a **scale of 1:1**. Use the given centre lines and point P on the Body (part A) as reference to plan the drawing layout.

4.1 Draw a **half-sectional Front View** of the assembled components on cutting plane A-A.

4.2 Draw an outside **Right View** of the **body** (part A), the **nut** (part B) and the **screw** (part C) of the assembled components on the given centre lines.

4.3 Please note the following:

4.3.1 Show **3 faces** of the **hexagonal screw** (part C) in the front view.

4.3.2 Show an **auxiliary view** for the **hexagonal screw** (part C).

4.4 Show the **hidden detail** on the **right view** of **only** the **hexagonal screw** (part C).

4.5 Draw the **cutting plane A-A**.

4.6 Insert 3 functional **dimensions** in the **front view**.

4.7 Draw the **projection symbol** in the space provided.

4.8 Print the **title** and **scale** in the space provided.

4.9 Label the **front view**.

COMPONENT LIST

NO	PART	QUANTITY	MATERIAL
A	BODY	1	CAST IRON
B	NUT M32 x 4 THREAD	1	HIGH-TENSILE STEEL
C	HEXAGONAL SCREW M32 x 4 THREAD	1	HIGH-TENSILE STEEL
D	SPACER	1	PHOSPHOR BRONZE
E	CUP	1	STEEL

EXAMINATION NUMBER

100 MARKS

QUESTION 4

MECHANICAL
ASSEMBLY

ASSESSMENT CRITERIA

FRONT VIEW		
A	BODY	15
B	NUT	7
C	SCREW	11
D	CUP	9
E	SPACERS	2
TOTAL		44

RIGHT VIEW		
A	BODY	13
B	NUT	7
C	SCREW	7
HIDDEN DETAIL		9
TOTAL		36

ADDITIONAL		
CORRECT ASS.	3	
HATCHING	5	
NON-HATCHING	3	
DIMENSIONS	3	
CUTTING PLANE	2	
SYMBOL	1	
TITLE/SCALE/LABEL	3	
TOTAL		20
TOTAL		100

P

TITLE:	
SCALE:	

SYMBOL:	
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ANSWER SHEET 4

EXAMINATION NUMBER											