

### INSTRUCTIONS AND INFORMATION

1. This 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 questions must be answered on the question paper, as instructed.
7. ALL pages must be placed in numerical order and stapled in ONLY the TOP LEFT CORNER, regardless whether the question was answered or not.
8. Time management is essential in order to complete all the questions.
9. Print your examination number in the block provided on each page.
10. Dimension detail not given must be estimated in good proportion.

| EXAMINATION NATIONAL SENIOR CERTIFICATE |                                 |
|---|---------------------------------|
| DATE                                    | NOVEMBER 2024                   |
| SUBJECT                                 | ENGINEERING GRAPHICS AND DESIGN |
| PAPER                                   | 2                               |
| MARKS                                   | 100                             |
| TIME                                    | 3 Hours                         |
| NUMBER OF PAGES                         | 6                               |

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|-----------------------|---------------|---|---|---|------|-----------|---|---|---|------|------------|---|---|---|------|
| QUESTION              | MARK OBTAINED |   |   | ½ | SIGN | MODERATED |   |   | ½ | SIGN | RE-MARKING |   |   | ½ | SIGN |
| 1                     |               |   |   |   |      |           |   |   |   |      |            |   |   |   |      |
| 2                     |               |   |   |   |      |           |   |   |   |      |            |   |   |   |      |
| 3                     |               |   |   |   |      |           |   |   |   |      |            |   |   |   |      |
| 4                     |               |   |   |   |      |           |   |   |   |      |            |   |   |   |      |
| TOTAL:                |               |   |   |   |      |           |   |   |   |      |            |   |   |   |      |
|                       | 2             | 0 | 0 |   |      | 2         | 0 | 0 |   |      | 2          | 0 | 0 |   |      |

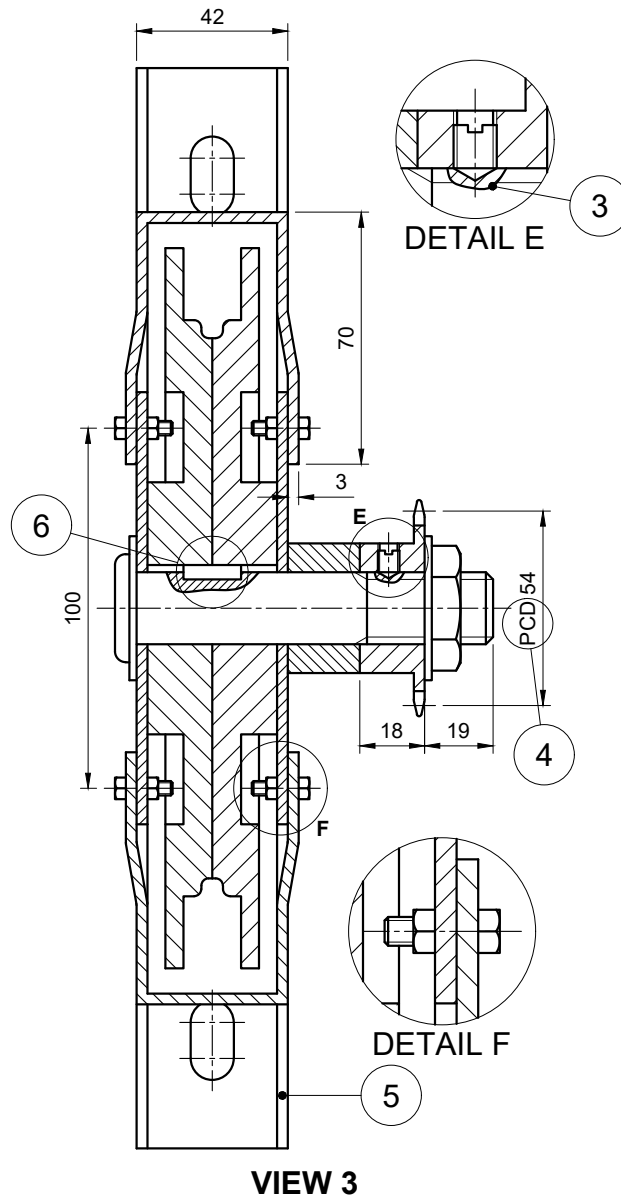
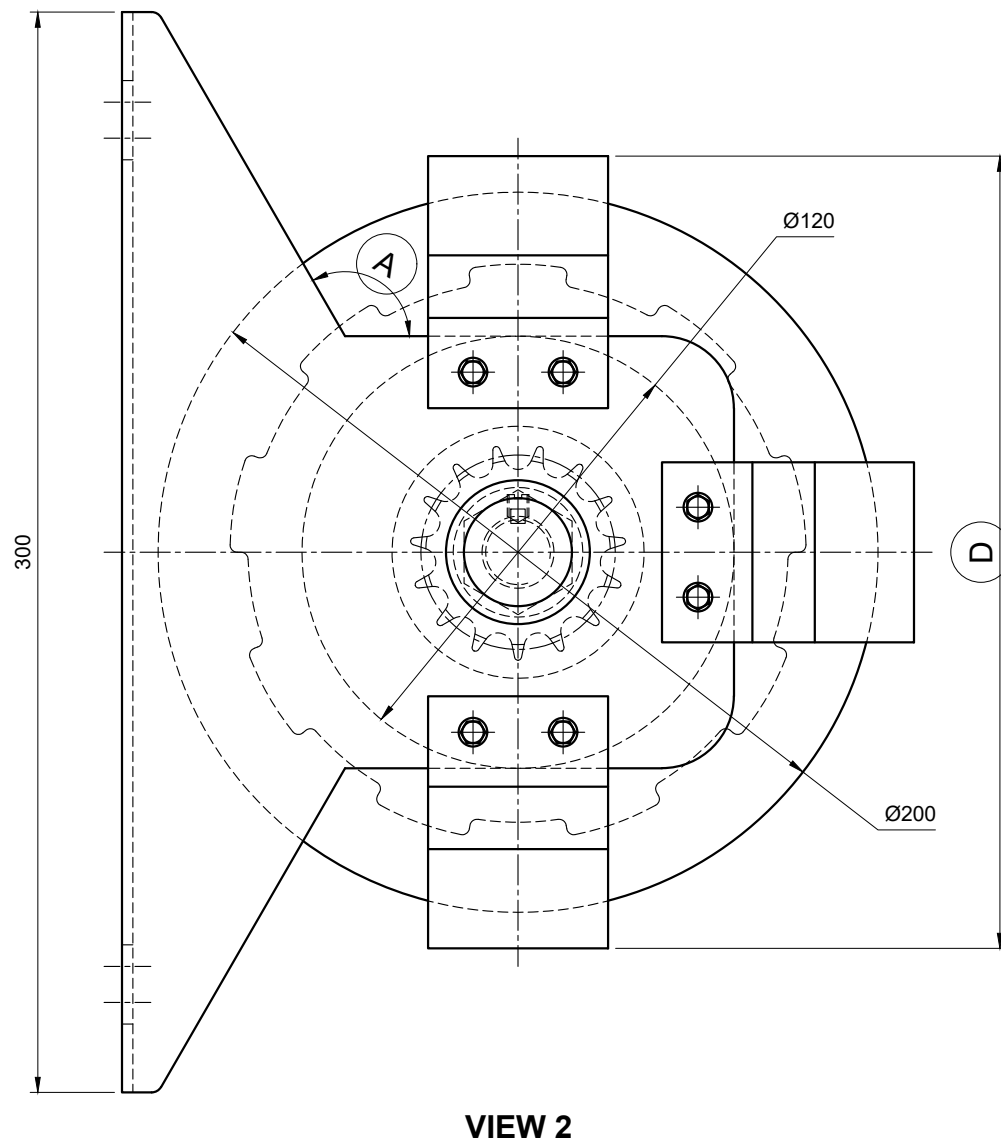
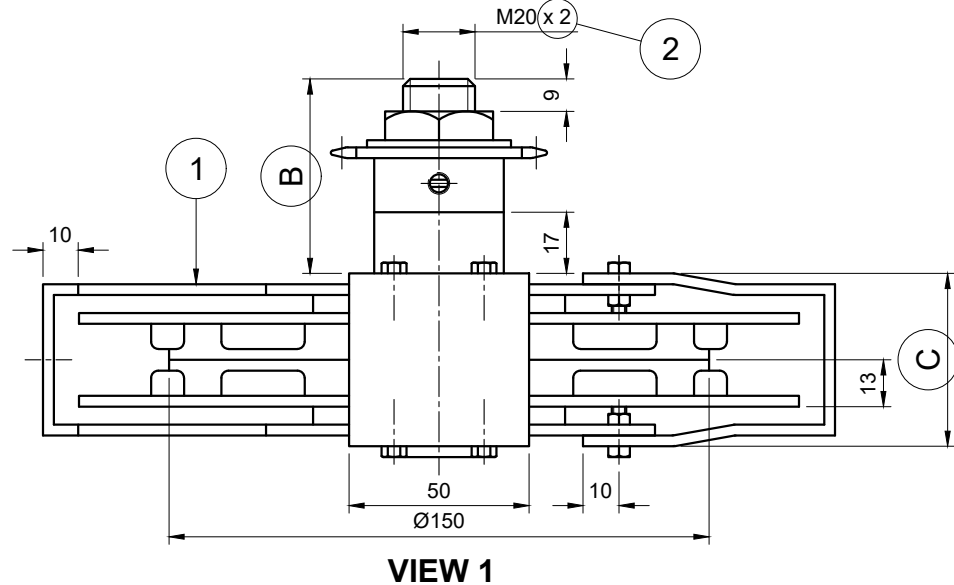


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|----------------------|---------|
| FINAL CONVERTED MARK | CHECKED |
| <u>100</u>           |         |

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| EXAMINATION NUMBER    |
| EXAMINATION NUMBER    |

STAPLE



**QUESTION 1: MECHANICAL ANALYTICAL**

**Given:**  
Three views of a chain hoist assembly, 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             | What is the web address for the company responsible for this drawing?                                   |           | 1 |
| 2             | Who is responsible for checking the drawing?  |           | 1 |
| 3             | On which date was the drawing prepared?   |           | 1 |
| 4             | The indicated scale for this drawing is 1 : 4. Is this drawing presented to this scale?                 |           | 1 |
| 5             | How many chain hoists are required?   |           | 1 |
| 6             | What is VIEW 3 called?  |           | 2 |
| 7             | Measure the angle at A.   |           | 1 |
| 8             | Determine the dimensions at:  | B:        | 1 |
|               |   | C:        | 1 |
|               |   | D:        | 1 |
| 9             | What type of line is at 1?  |           | 1 |
| 10            | What does the encircled feature at 2 indicate?  |           | 1 |
| 11            | Name the type of section at 3.  |           | 1 |
| 12            | What does the abbreviation at 4 stand for?  |           | 1 |
| 13            | Why is the area at 5 not hatched?   |           | 1 |
| 14            | With reference to the encircled feature at 6, what would be the purpose of the key?                     |           | 2 |
| 15            | If a standard bolt is used, determine the across flat dimension for a M4 bolt. Show calculation.        |           | 2 |
| 16            | Insert the cutting plane on VIEW 2 for VIEW 3, and label it T-T.  |           | 3 |
| 17            | In the space provided (ANSWER 17), draw in neat freehand, the conventional representation of a BEARING. |           | 4 |
| 18            | In the space provided (ANSWER 18), draw in neat freehand, the symbol for the projection system used.    |           | 3 |
| <b>TOTAL:</b> |   | <b>30</b> |   |

ANSWER 17: BEARING

ANSWER 18: PROJECTION SYMBOL

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EXAMINATION NUMBER

EXAMINATION NUMBER

2

|  |  |   |   |
|--|--|---|---|
| GTX<br>drafting<br>1510 NICHOLSON STREET,<br>KLERKDORP, 2020<br>083 899 4568<br>www.gtxdraft.co.za | DRAWN: SAKKIE<br>CHECKED: RAMI<br>APPROVED: TSHEPISO | DATE: 07/08/2023<br>DATE: 11/08/2023<br>DATE: 16/08/2023                                  | DRAWING PROGRAM: AUTOCAD 2024<br>SCALE 1 : 4          |
|  | TITLE:<br><b>CHAIN HOIST ASSEMBLY</b>                | UNLESS OTHERWISE SPECIFIED, ALL TOLERANCES ARE ±0,25<br>ALL DIMENSIONS ARE IN MILLIMETRES | DRAWING NUMBER: EGD-P2B<br>QUANTITY: 1500 CHAIN HOIST |

STAPLE

P

**QUESTION 2: LOCI (CAM)**

**Given:**

- The camshaft of a cam and the detail of a roller follower at the minimum distance from the camshaft.
- The position of point P on the drawing sheet.

**Specifications:**

- The minimum distance from the cam profile to the centre of the camshaft = 13 mm
- Rotation = clockwise

**Motion:**

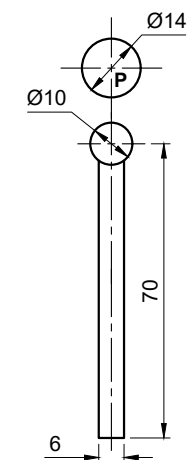
A cam rotates at constant velocity, imparting the following motion to the follower:

- Over the first 90° the follower falls 64 mm with uniform acceleration and retardation
- For the next 45° the follower remains in rest
- It rises 24 mm over the next 45° with uniform motion
- It returns to the original position with simple harmonic motion over the remainder of the rotation

**Instructions:**

- Using the given centre point P, draw, to a scale of 1 : 1, the given camshaft and follower at the minimum distance.
- Draw, to a rotational scale of 108 mm = 360° and a displacement scale of 1 : 1, the complete displacement graph for the given motion.
- Label the displacement graph and include the rotational scale.
- Using the given position of the follower as 0°, project and draw the cam profile from the displacement graph.
- Show the direction of rotation on the cam profile.
- Show ALL construction.

[38]



| ASSESSMENT CRITERIA |   |           |  |   |
|---------------------|---|-----------|--|---|
| 1                   | FOLLOWER + MIN. DIST. + CAMSHAFT + CENT. LINE | 4         |  |   |
| 2                   | DISPLACEMENT GRAPH + CONSTRUCTION             | 16 ½      |  |   |
| 3                   | CONSTR + DIRECTION                            | 5         |  |   |
| 4                   | PLOTTING + CURVES                             | 12 ½      |  |   |
| PENALTIES(-):       |   |           |  |   |
| <b>TOTAL:</b>       |   | <b>38</b> |  |   |
| EXAMINATION NUMBER  |   |           |  |   |
|                     |   |           |  | 3 |

STAPLE

**QUESTION 3: ISOMETRIC DRAWING**

**Given:**

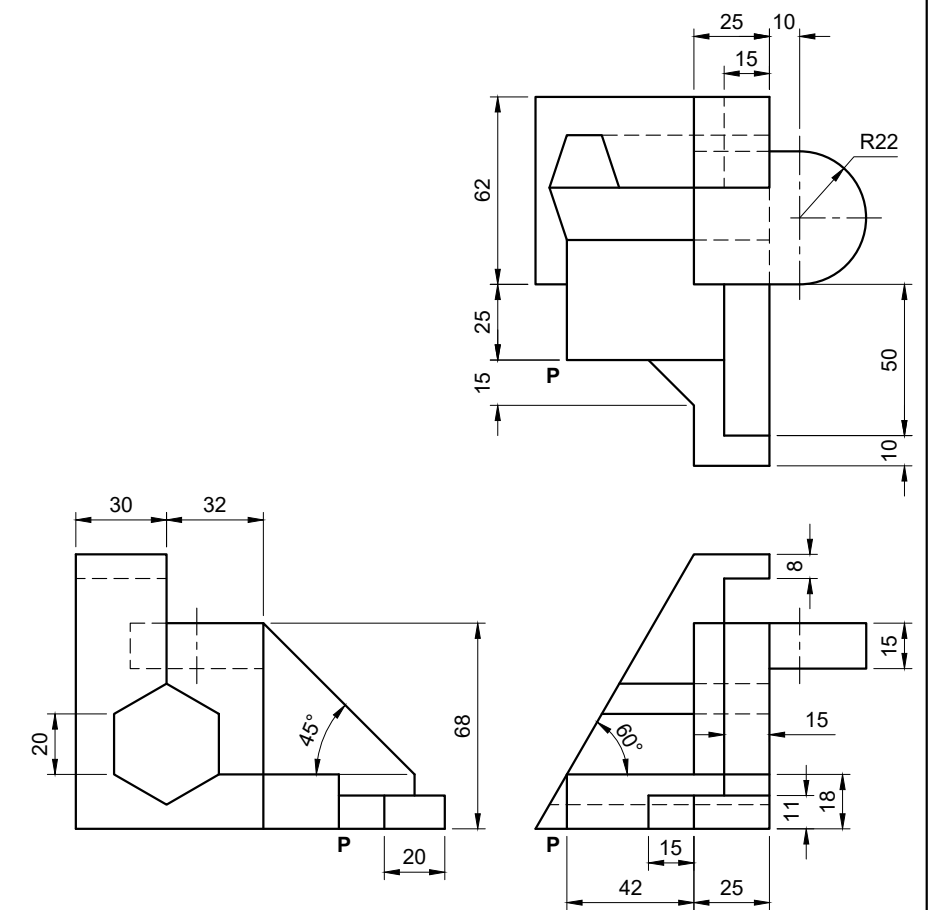
- The front view, top view and left view of a casting.
- The position of point P on the drawing sheet.

**Instructions:**

Using scale 1 : 1, convert the given orthographic views of the casting into an isometric drawing.

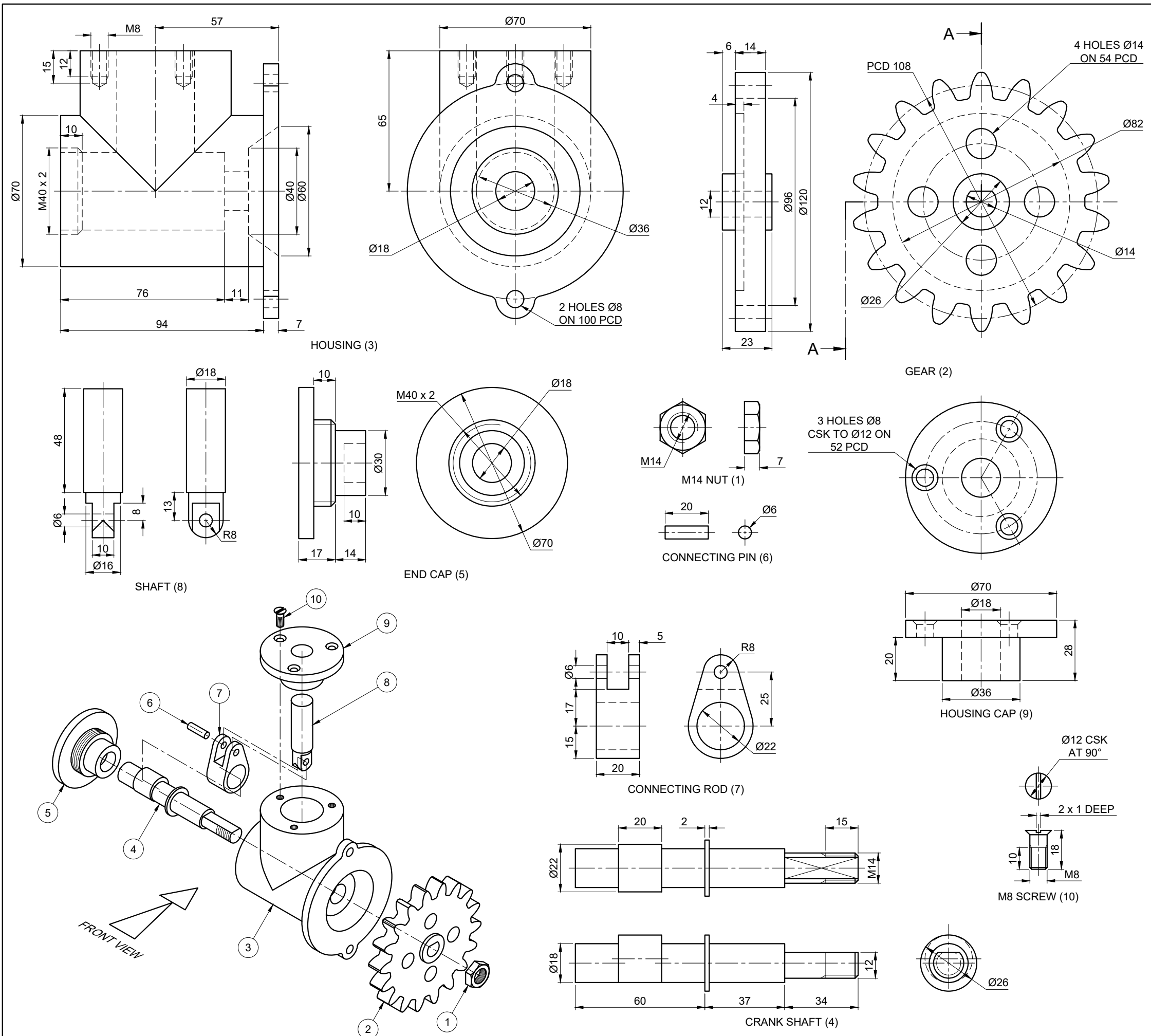
- Make point P the lowest point of the drawing.
- Show ALL construction.
- No hidden detail is required.

[38]



↓  
P

| ASSESSMENT CRITERIA |                                     |           |  |   |
|---------------------|-------------------------------------|-----------|--|---|
| 1                   | AUXILIARY VIEWS + PLACEMENT         | 3         |  |   |
| 2                   | LOWER PORTION                       | 21½       |  |   |
| 3                   | UPPER PORTION                       | 8         |  |   |
| 4                   | CIRCLE+ CENTRE LINES + CONSTRUCTION | 5½        |  |   |
| PENALTIES(-):       |                                     |           |  |   |
| <b>TOTAL:</b>       |                                     | <b>38</b> |  |   |
| EXAMINATION NUMBER  |                                     |           |  |   |
| EXAMINATION NUMBER  |                                     |           |  | 4 |



**QUESTION 4: MECHANICAL ASSEMBLY**

**Given:**

- The exploded isometric drawing of a transfer box assembly, showing the positions of each part relevant to one another.
- Orthographic views of each part of the transfer box assembly.

**Instructions:**

- Answer this question on page 6,
- Draw, to a scale of 1 : 1 and in third angle orthographic projection, the following views of the assembled transfer box:

- 4.1 **A half sectional front view**, with the top half in section, on cutting plane A-A, as seen from the direction of the arrow shown on the exploded isometric view. The cutting plane is shown on the right view of the gear (part 2).
- 4.2 **The right view.**

**NOTE:**

- Planning is essential.
- The drawing must comply with the *SANS 10111* guidelines.
- The gear (part 2) must be drawn as a conventional representation.
- Show three faces for the M14 nut (part 1) on the sectional front view.
- No hidden detail is required.

[94]

**PARTS LIST**

| No. | PART NAME      | QUANTITY |
|-----|----------------|----------|
| 1   | M14 NUT        | 1        |
| 2   | GEAR           | 1        |
| 3   | HOUSING        | 1        |
| 4   | CRANK SHAFT    | 1        |
| 5   | END CAP        | 1        |
| 6   | CONNECTING PIN | 1        |
| 7   | CONNECTING ROD | 1        |
| 8   | SHAFT          | 1        |
| 9   | HOUSING CAP    | 1        |
| 10  | M8 SCREW       | 1        |

**NEW SEASONED  
DESIGNS**

36 WILGEN STREET,  
POTCHEFSTROOM, 2012  
082 5505 549

**TRANSFER BOX**

ALL DIMENSIONS ARE IN MILLIMETERS



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|-----------------------------------|--|
| INCORRECT ORTHOGRAPHIC PROJECTION |  |
| INCORRECT OVERALL SCALE           |  |
| INCORRECT HATCHING                |  |
| PARTS NOT ASSEMBLED               |  |
|                                   |  |
|                                   |  |
| TOTAL:                            |  |

| ASSESSMENT CRITERIA       |                       |           |  |          |
|---------------------------|-----------------------|-----------|--|----------|
| RIGHT VIEW                |                       |           |  |          |
| 1                         | CRANK SHAFT + M14 NUT | 5         |  |          |
| 2                         | GEAR                  | 4         |  |          |
| 3                         | HOUSING + HOUSING CAP | 5 ½       |  |          |
| SUBTOTAL:                 |                       | 14 ½      |  |          |
| SECTIONAL FRONT VIEW      |                       |           |  |          |
| 1                         | GEAR                  | 11        |  |          |
| 2                         | M14 NUT               | 4         |  |          |
| 3                         | CRANK SHAFT           | 11 ½      |  |          |
| 4                         | CONNECTING ROD        | 2 ½       |  |          |
| 5                         | PIN                   | 1 ½       |  |          |
| 6                         | SHAFT                 | 4 ½       |  |          |
| 7                         | HOUSING CAP           | 4 ½       |  |          |
| 8                         | M8 SCREW              | 5 ½       |  |          |
| 9                         | HOUSING               | 18        |  |          |
| 10                        | END CAP               | 4 ½       |  |          |
| SUBTOTAL:                 |                       | 67 ½      |  |          |
| GENERAL                   |                       |           |  |          |
| 1                         | CENTER LINES          | 3         |  |          |
| 2                         | ASSEMBLY              | 9         |  |          |
| SUBTOTAL:                 |                       | 12        |  |          |
| <b>TOTAL:</b>             |                       | <b>94</b> |  |          |
| PENALTIES(-):             |                       |           |  |          |
| <b>GRAND TOTAL:</b>       |                       |           |  |          |
| <b>EXAMINATION NUMBER</b> |                       |           |  |          |
|                           |                       |           |  |          |
| <b>EXAMINATION NUMBER</b> |                       |           |  | <b>6</b> |