



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE EXAMINATIONS/
NATIONAL SENIOR CERTIFICATE EXAMINATIONS

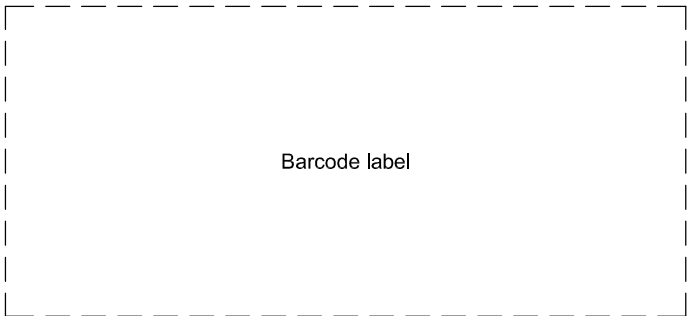
ENGINEERING GRAPHICS AND DESIGN P2

MAY/JUNE 2024

MARKS: 100

TIME: 3 hours

This question paper consists of 6 pages.



Barcode label

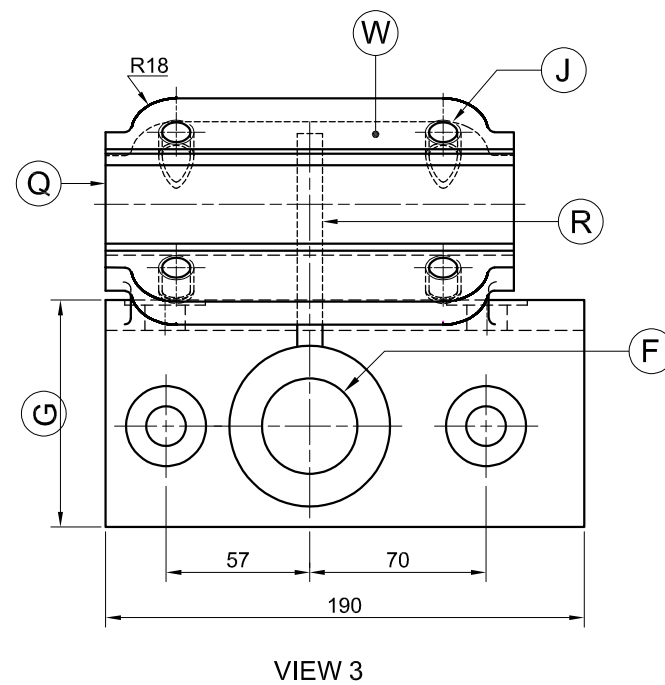
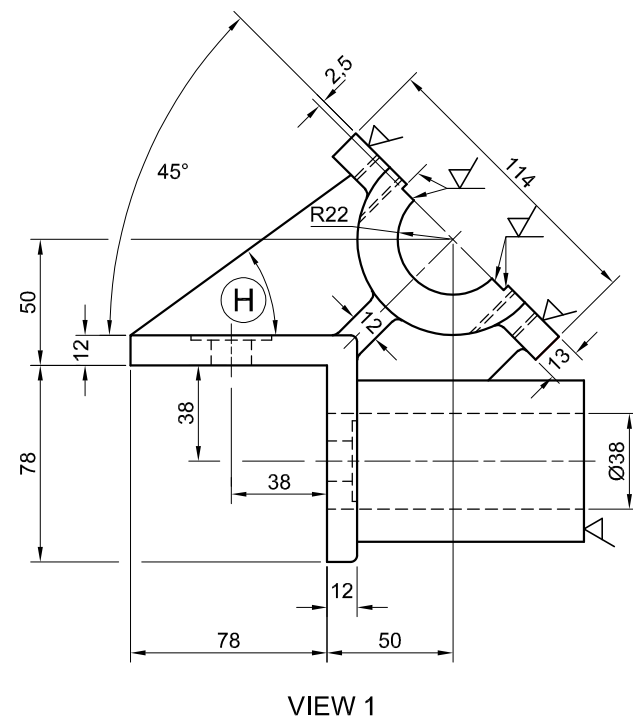
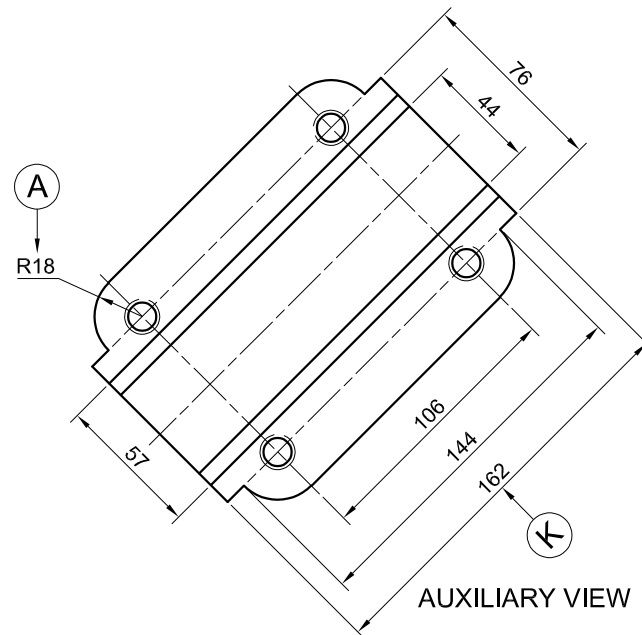
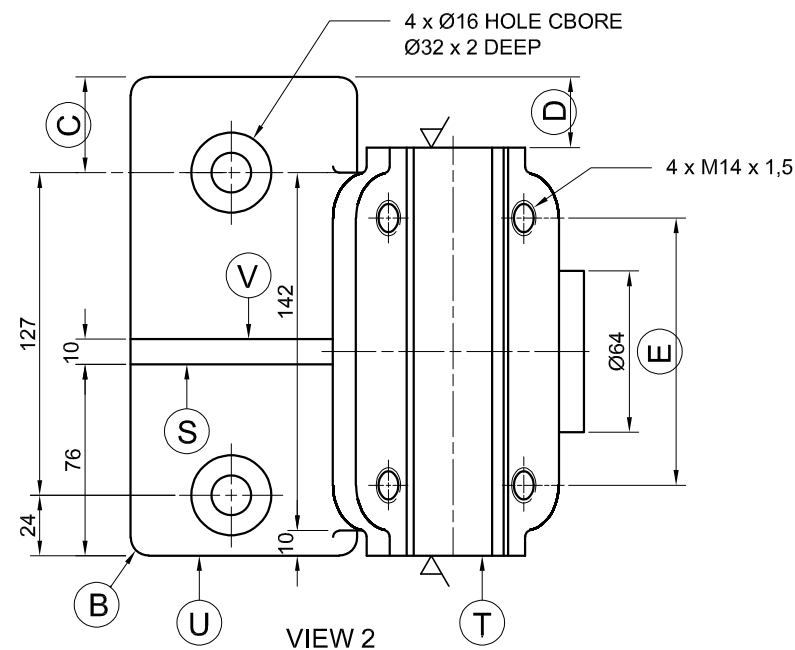
INSTRUCTIONS AND INFORMATION

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 | | | $\frac{1}{2}$ | SIGN | MODERATED | | | $\frac{1}{2}$ | SIGN | RE-MARKING | | | $\frac{1}{2}$ | 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 |
| |



| | | | | |
|---|-----------------------|--------------|--------------------------------------|----------------------------|
| COMMISSIONED BY: BRACKETS FOR AFRICA HANGER STREET CAPE TOWN | DRAWING PROGRAMME: | AUTOCAD 2023 | ALL DIMENSIONS ARE IN MILLIMETRES. | |
| | | | QUANTITY: 1500 | |
| FILE NAME: JJVWBJ-6 | DRAWING No. 013 | SCALE 1 : 3 | DRAWN BY: VERNON | DATE: 2023-05-19 |
| MECHANICAL DRAUGHTERS 63 HUBBLE ROAD CAPE TOWN 7700 www.mecdraw.co.za 021 291 0910 | | | CHECKED BY: BARRY | DATE: 2023-05-27 |
| | | | APPROVED: SIPHO | DATE: 2023-05-31 |
| TITLE: CORNER BRACKET | | | ALL UNSPECIFIED RADII ARE 2,5 mm. | TOLERANCE : +0,02 -0,17 |

2



QUESTION 1: ANALYTICAL (MECHANICAL)

Given:

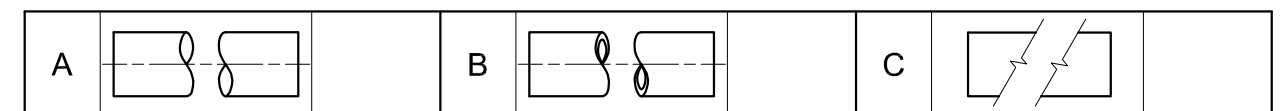
The front view, top view, right view and an auxiliary view of a corner bracket, a title block and a table of questions. The drawing is not presented to the indicated scale.

Instructions:

Complete the table below by neatly answering the questions, which refer to the accompanying drawings, title block and mechanical content. **[30]**

| QUESTIONS | | ANSWERS | | |
|-----------|--|---------|----|--|
| 1 | Who approved the drawing? | | 1 | |
| 2 | What is the web address of the draughting firm? | | 1 | |
| 3 | What is the file name of the drawing? | | 1 | |
| 4 | How many corner brackets must be manufactured? | | 1 | |
| 5 | What drawing method has been used to prepare the drawing? | | 1 | |
| 6 | How deep is the counter bore of the 4 x Ø16 holes? | | 1 | |
| 7 | If a scale of 1 : 1 was used, how would the dimension at A read? | | 1 | |
| 8 | Which VIEW is the front view of the drawing? | | 1 | |
| 9 | How many threaded holes are on the bracket? | | 1 | |
| 10 | Name the feature at B. | | 1 | |
| 11 | Determine the complete dimensions at : C : D : E : F : G : | | 5 | |
| 12 | Measure the angle at H. | | 1 | |
| 13 | Determine the complete dimension at J. | | 2 | |
| 14 | With reference to the tolerance, determine the maximum and minimum dimensions for K. | | 2 | |
| 15 | How many surfaces on the corner bracket must be machined? | | 1 | |
| 16 | Match the surfaces labelled Q and R on VIEW 3 with the corresponding labelled surfaces on VIEW 2. | Q: | 2 | |
| | | R: | | |
| 17 | Which view shows the true shape of the surface at W? | | 1 | |
| 18 | What is indicated by C on the machining symbol at 1 in the title block? | | 1 | |
| 19 | What does the machining symbol at 2 in the title panel indicate? | | 1 | |
| 20 | In the space below (ANSWER 20), complete, in neat freehand, the side view of each of the three SANS 1011 conventions of the interrupted views shown. | | 4 | |
| TOTAL | | | 30 | |

ANSWER 20



EXAMINATION NUMBER

EXAMINATION NUMBER

2



P+

QUESTION 2: LOCI (CAM)

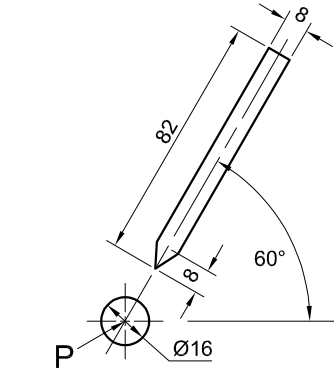
- Given:**
- The detail of a camshaft and a wedge-shaped follower at the minimum distance from the camshaft centre
 - The position of centre point P on the drawing sheet

- Specifications:**
- The wedge-shaped follower reciprocates along a 60° line that passes through the centre of the camshaft.
 - The **minimum** distance from the follower to the centre of the camshaft = 20 mm
 - Rotation = anti-clockwise

- Motion:**
- The cam imparts the following motion to the wedge-shaped follower:
- It rises 40 mm over the first 60° with uniform motion.
 - There is a dwell period for the next 30°.
 - It rises to its maximum displacement of 80 mm over the next 90° with uniform motion.
 - It descends 40 mm over the next 90° with simple harmonic motion.
 - It returns to its original position with uniform acceleration and retardation over the remainder of the rotation.

- Instructions:**
- Using centre point P on the drawing sheet, draw, to scale 1 : 1, the camshaft and wedge-shaped follower in the given position.
 - Draw to a rotational scale of 30° = 8 mm and a displacement scale of 1 : 1, the complete displacement graph for the required motion.
 - Using the given position of the follower as 0°, project and draw the cam profile from the displacement graph.
 - Indicate the direction of rotation on the cam profile with an arrow.
 - Indicate the rotational scale of the graph.
 - Show ALL construction and projection.

[37]



WEDGE-SHAPED FOLLOWER
AND CAMSHAFT DETAIL

| ASSESSMENT CRITERIA | | | | | |
|---------------------|-------------------------------|----|--|--|---|
| 1 | GIVEN + MINIMUM DISTANCE + CL | 5 | | | |
| 2 | GRAPH CONSTRUCTION | 7 | | | |
| 3 | PLOTTING GRAPH + GRAPH CURVES | 9 | | | |
| 4 | CAM CONSTRUCTION | 5 | | | |
| 5 | PLOTTING + CAM PROFILE | 11 | | | |
| PENALTIES (-) | | | | | |
| TOTAL | | 37 | | | |
| EXAMINATION NUMBER | | | | | |
| | | | | | |
| EXAMINATION NUMBER | | | | | 3 |



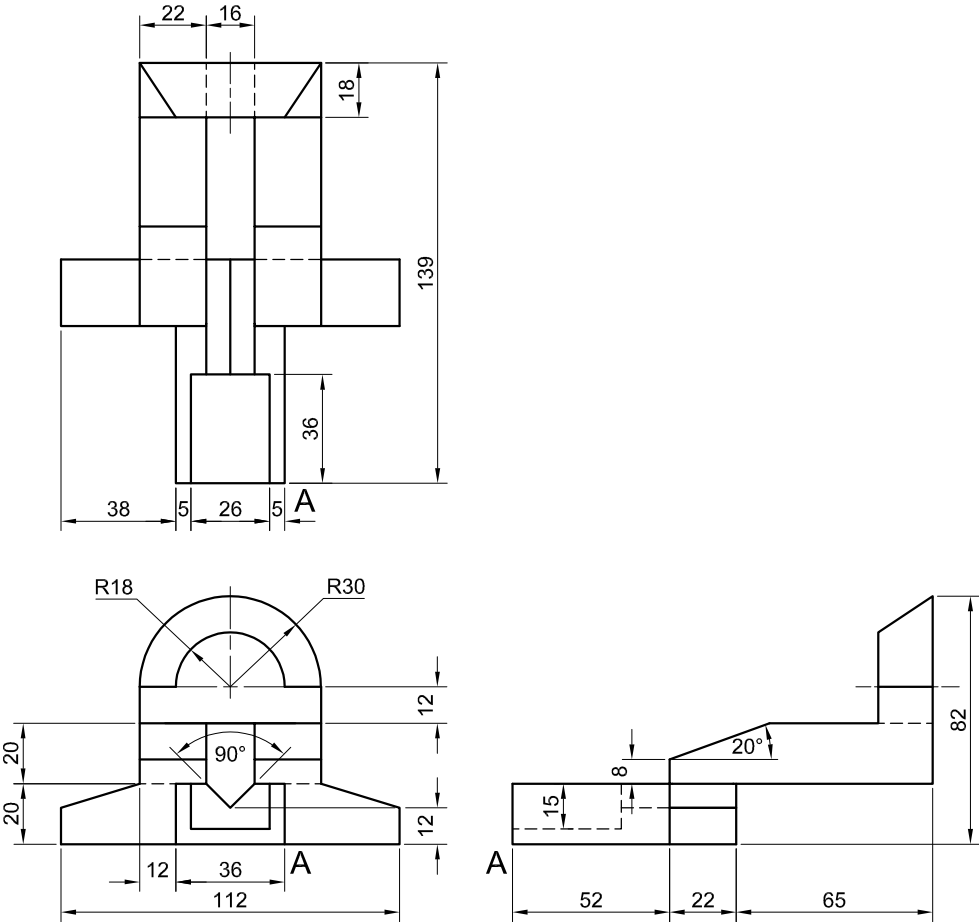
QUESTION 3: ISOMETRIC DRAWING

- Given:**
- The front view, top view and right view of a casting
 - The position of point A on the drawing sheet

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

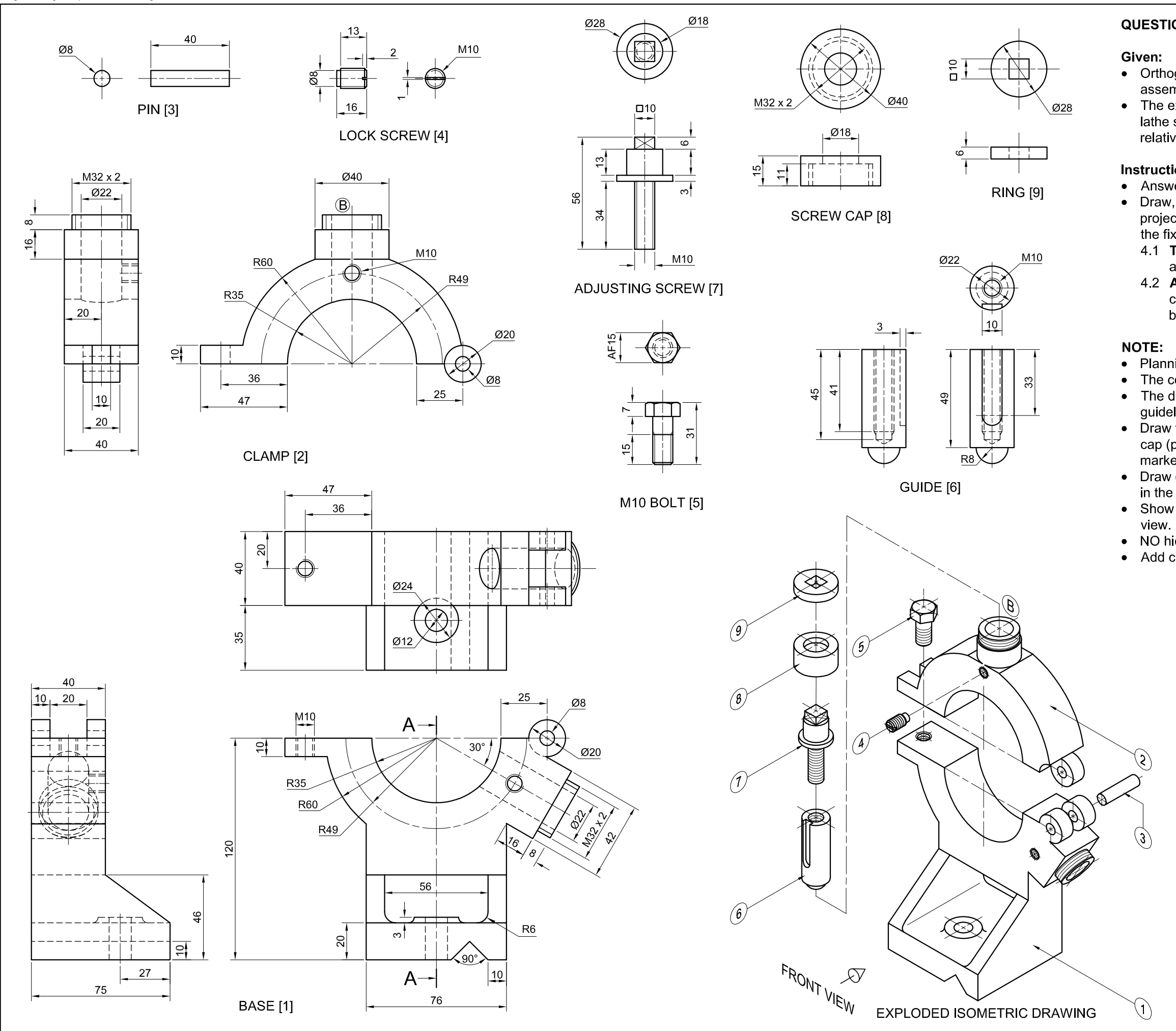
- Use A as the starting and lowest point of the drawing.
- Show ALL construction.
- NO hidden detail is required.

[40]



↓
A

| ASSESSMENT CRITERIA | | | | | |
|---------------------|---------------------|--------------------------------|--|--|---|
| 1 | PLACING + AUX. VIEW | 2 | | | |
| 2 | FRONT PORTION | 12 ¹ / ₂ | | | |
| 3 | UPPER PORTION | 18 ¹ / ₂ | | | |
| 4 | ARCS + CONSTR. + CL | 7 | | | |
| PENALTIES (-) | | | | | |
| TOTAL | | 40 | | | |
| EXAMINATION NUMBER | | | | | |
| | | | | | |
| EXAMINATION NUMBER | | | | | 4 |



QUESTION 4: MECHANICAL ASSEMBLY

- Given:**
- Orthographic views of each part of the fixed lathe steady assembly
 - The exploded isometric drawing of the parts of a fixed lathe steady assembly, showing the position of each part relative to all the others

- 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 fixed lathe steady assembly:
 - 4.1 **The front view** as seen from the direction of the arrow on the exploded isometric drawing.
 - 4.2 **A sectional left view** on cutting plane A-A. The cutting plane is shown on the front view of the base (part 1).

- NOTE:**
- Planning is essential.
 - The convention of symmetry may NOT be applied.
 - The drawing must comply with the SANS 10111 guidelines.
 - Draw the guide (part 6), adjusting screw (part 7), screw cap (part 8) and the ring (part 9) only in the top hole marked B.
 - Draw only the top lock screw (part 4) in position, as shown in the exploded isometric drawing.
 - Show THREE faces of the M10 bolt (part 5) in the front view.
 - NO hidden detail is required.
 - Add cutting plane A-A.

[93]

| PARTS LIST | | | |
|------------|-----------------|----------|-----------|
| | PARTS | QUANTITY | MATERIAL |
| 1 | BASE | 1 | CAST IRON |
| 2 | CLAMP | 1 | CAST IRON |
| 3 | PIN | 1 | STEEL |
| 4 | LOCK SCREW | 1 | STEEL |
| 5 | M10 BOLT | 1 | STEEL |
| 6 | GUIDE | 1 | BRASS |
| 7 | ADJUSTING SCREW | 1 | STEEL |
| 8 | SCREW CAP | 1 | BRASS |
| 9 | RING | 1 | ALUMINIUM |

GUIDANCE
ENGINEERING CC

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012 345 6789

FIXED STEADY ASSEMBLY

ALL DIMENSIONS ARE IN MILLIMETRES.



5

| FOR OFFICIAL USE ONLY | |
|-----------------------------------|--|
| INCORRECT ORTHOGRAPHIC PROJECTION | |
| INCORRECT OVERALL SCALE | |
| INCORRECT HATCHING | |
| PARTS NOT ASSEMBLED | |
| | |
| TOTAL PENALTIES (-) | |

| ASSESSMENT CRITERIA | | | | | |
|---------------------|-------------------|------------------------------------|----------|------|-----------|
| FRONT VIEW | | | | | |
| | | POSSIBLE | OBTAINED | SIGN | MODERATED |
| 1 | BASE | 15 | | | |
| 2 | CLAMP + PIN | 5 | | | |
| 3 | SCREW CAP + RING | 3 | | | |
| 4 | GUIDE | 1 | | | |
| 5 | LOCK SCREW | 2 $\frac{1}{2}$ | | | |
| 6 | M10 BOLT | 6 | | | |
| 7 | ADJUSTING SCREW | 1 | | | |
| SUBTOTAL | | 33 $\frac{1}{2}$ | | | |
| SECTIONAL LEFT VIEW | | | | | |
| 1 | BASE | 12 | | | |
| 2 | CLAMP | 7 | | | |
| 3 | GUIDE | 8 $\frac{1}{2}$ | | | |
| 4 | ADJUSTING SCREW | 6 $\frac{1}{2}$ | | | |
| 5 | RING | 3 | | | |
| 6 | LOCK SCREW | 4 $\frac{1}{2}$ | | | |
| 7 | SCREW CAP | 3 | | | |
| SUBTOTAL | | 44 $\frac{1}{2}$ | | | |
| GENERAL | | | | | |
| 1 | CENTRE LINES | 4 | | | |
| 2 | ASSEMBLY | 8 | | | |
| 3 | CUTTING PLANE A-A | 3 | | | |
| SUBTOTAL | | 15 | | | |
| TOTAL | | 93 | | | |
| PENALTIES (-) | | | | | |
| GRAND TOTAL | | | | | |
| EXAMINATION NUMBER | | | | | |
| | | | | | |
| EXAMINATION NUMBER | | | | | 6 |