higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE

MECHANICAL DRAUGHTING

(8090244)

14 November 2019 (X-Paper)
09:00–13:00

CLOSED-BOOK EXAMINATION

REQUIREMENTS: ONE A2 drawing sheet

Drawing instruments and calculators may be used.

This question paper consists of 5 pages and 4 diagram sheets.

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DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE
MECHANICAL DRAUGHTING
TIME: 4 HOURS
MARKS: 100

INSTRUCTIONS AND INFORMATION

1. Answer ALL the questions.
2. Read ALL the questions carefully.
3. Number the answers according to the numbering system used in this question paper.
4. Use both sides of the DRAWING SHEET.
5. Print ALL candidate information in the title block in ink.
6. Do ALL drawings in pencil.
7. Draw a 15 mm border on both sides of the DRAWING SHEET.
8. Use your discretion for dimensions NOT given.
9. Use a 3 mm fillet radius for ALL radii NOT given.
10. ALL drawing work must comply with the SANS 0111-1990 Code of Practice.
11. Work neatly.

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QUESTION 1: CONVENTIONAL REPRESENTATION

FIGURE 1, DIAGRAM SHEET 1 (attached), shows a picture of a hydraulic shock absorber with a cylindrical helical spring.

Do NOT copy the given view, but draw, to scale 1:1, the conventional representation of the spring to show the left-handed turns in a vertical position.

Cylindrical helical spring data:

- Free length: 150 mm
- Lead: 20 mm
- Material diameter: 10 mm
- Centre diameter: 90 mm (8)

Place a maximum of FOUR essential dimensions on the completed drawing. (2)
[10]

QUESTION 2: CAM PROFILES

A cam profile which will impart motion to a knife-edge follower is required.

Draw, to scale 1:1, the full profile of a disc cam using the following cam data:

- Minimum diameter: 30 mm
- Stroke height (lift/fall): 40 mm
- Hole diameter: 20 mm
- Performance:
  - Dwells for the first 90° of cam rotation
  - Rises 40 mm in the next 150° of cam rotation according to uniform velocity
  - Dwells for the next 30° of cam rotation
  - Falls 40 mm in the last 90° of cam rotation according to uniform velocity
  - Rotation of cam is anticlockwise

Draw the displacement diagram on the left-hand side of the cam profile and show ALL construction lines. Do NOT draw the follower. Draw the keyway for the hole based on empirical values to calculate keyways.

HINT: Use D/4 and D/12 to determine the keyway sizes for the drawing. **[15]**

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QUESTION 3: SECTIONAL DRAWING

FIGURE 2, DIAGRAM SHEET 2 (attached), shows two views of a casted hose link for a water-irrigation unit.

Draw, to scale 1:1, the following views of the casting in third-angle orthographic projection:

3.1 A full-sectional front view of the water-irrigation unit (9)

3.2 A full-sectional left view on cutting plane X-X (7)

Show only the following dimensions and symbols on the drawing: (4)

At A and B: Indicate that these planes are to be machined. The roughness value of the surface texture is 6,3 µm.

NOTE: The M24 and M36 threads are fine pitch threads, therefore use only half of the normal empirical values. **[20]**

QUESTION 4: DETAIL DRAWING

FIGURE 3, DIAGRAM SHEET 3 (attached), shows a single full-sectional drawing of a square tool post on a lathe consisting of the following:

- Item 1 – Body
- Item 2 – Base plate
- Item 3 – M10 slotted screw and washer
- Item 4 – Securing nut
- Item 5 – Handle
- Item 6 – M12 tool-holder bolts
- Item 7 – Rod with ends

Draw, to scale 1:1, the following views of the casting in first-angle orthographic projection:

4.1 A half-sectional front view of the left half of the body (Item 1) showing the detail of the through drill and tapped hole in convention (9)

4.2 A full-sectional front view of the base plate (Item 2) (7)

4.3 A half-sectional front view of the right half of the securing nut (Item 4) showing the detail of the blind M5 drilled and tapped hole in convention (4)

Show hidden detail in the halves NOT in section of item 1 and 4 only. NO dimensions are required. **[20]**

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QUESTION 5: ASSEMBLY DRAWING

FIGURE 4, DIAGRAM SHEET 4 (attached), shows the components of a crane hook. The crane hook consists of the following parts shown in first-angle orthographic projection:

• Item 1	Crane hook	1 off	Mild steel
• Item 2	Support plate	2 off	Mild steel
• Item 3	Hook anchor	1 off	Mild steel
• Item 4	End bush	2 off	Mild steel
• Item 5	Plate spacers	3 off	Mild steel
• Item 6	Bush	1 off	Gun metal
• Item 7	M12 locknut	2 off	Mild steel
• Item 8	M15 locknut	6 off	Mild steel
• Item 9	M16 locknut	1 off	Mild steel
• Item 10	Washer	6 off	Mild steel
• Item 11	M6 bolt and nut	6 off	Mild steel
• Item 12	Diameter 3 mm × 25 pin	1 off	Mild steel

Draw, to scale 1:1, a full-sectional front view of the crane hook as an assembly drawing.

Use the front view of Item 1 as a starting position for the assembly. (20)

Insert the item number on the completed assembly. (6)

Show a parts list below the completed drawing. (4)
[30]

QUESTION 6: BALANCED LAYOUT AND NEATNESS

Layout, neatness and general impression of the DRAWING SHEET **[5]**

TOTAL: 100

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DIAGRAM SHEET 1

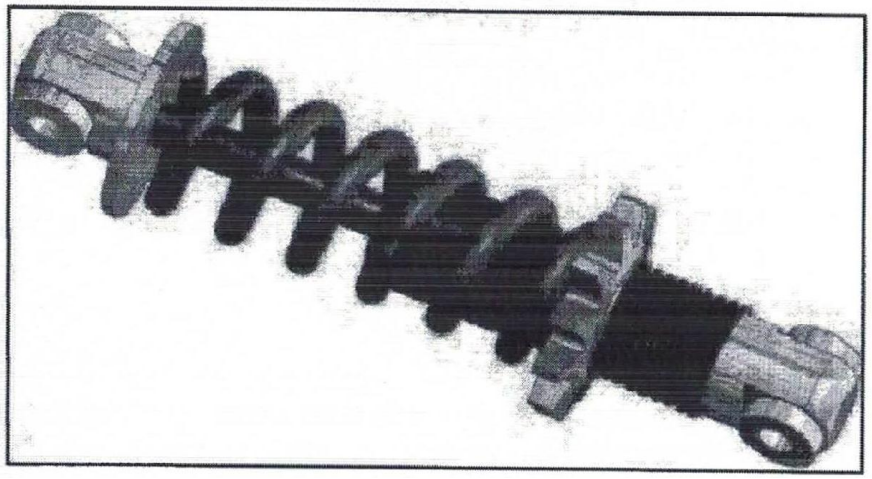


FIGURE 1

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DIAGRAM SHEET 2

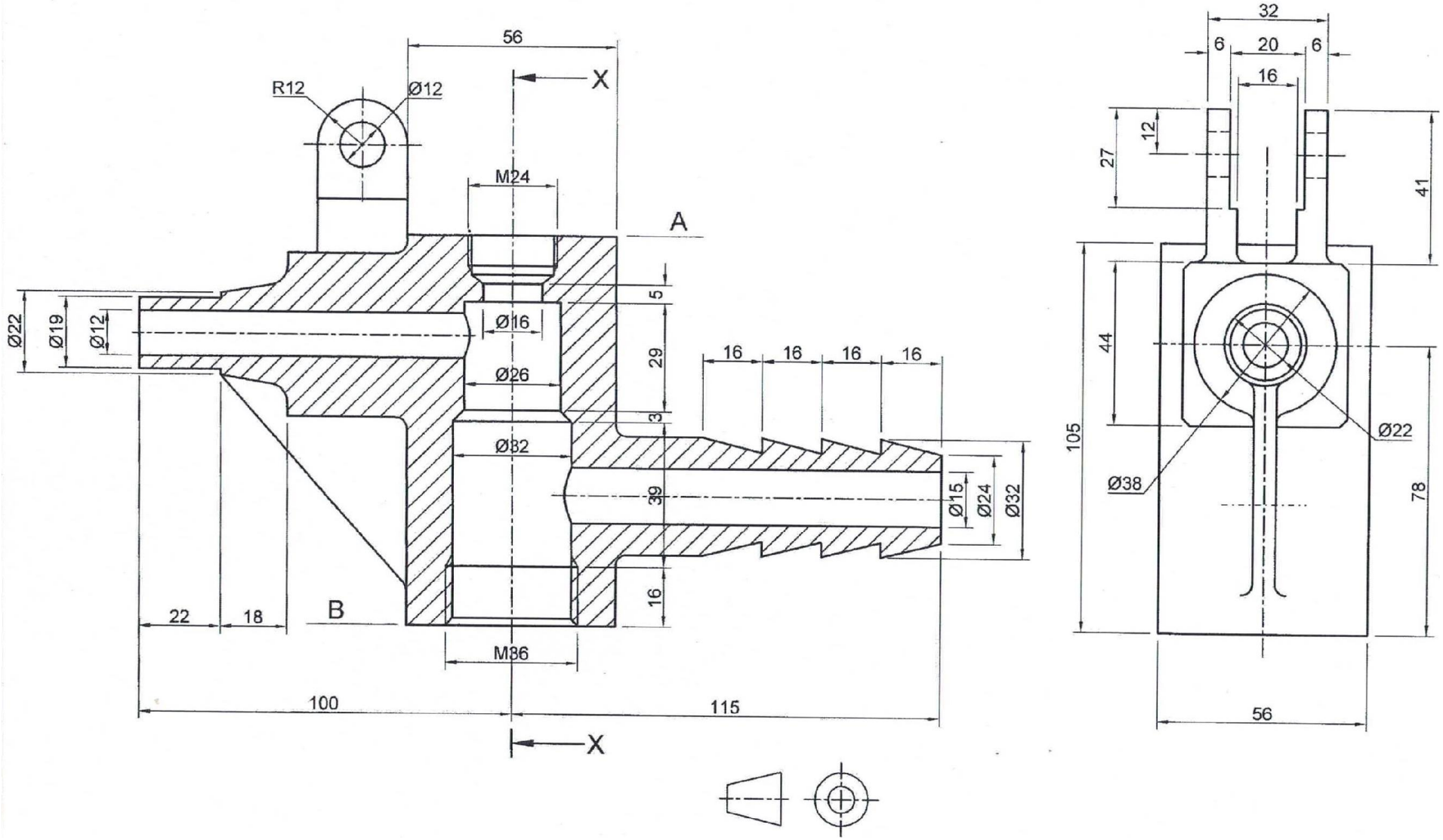


FIGURE 2

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DIAGRAM SHEET 3

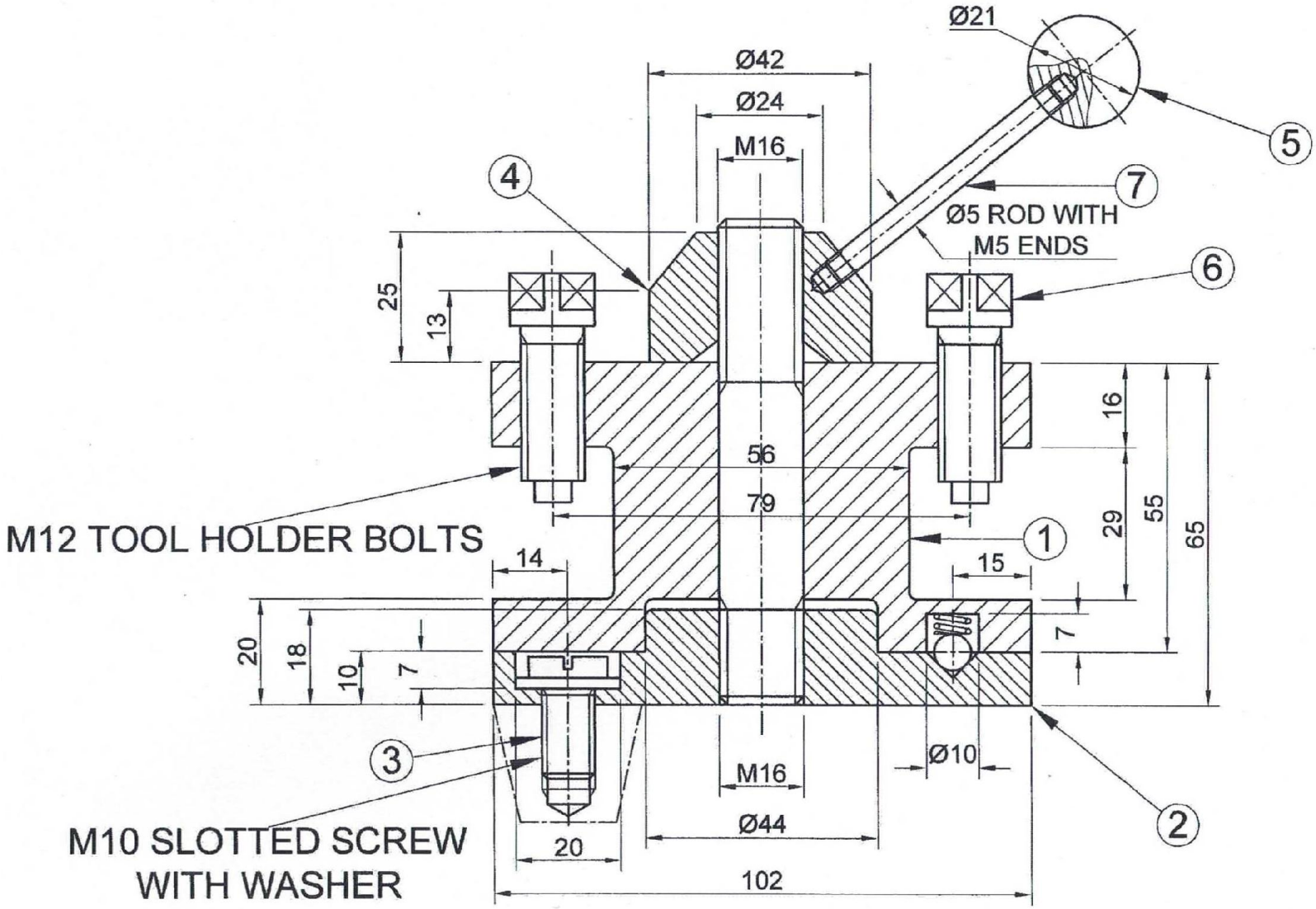


FIGURE 3

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DIAGRAM SHEET 4

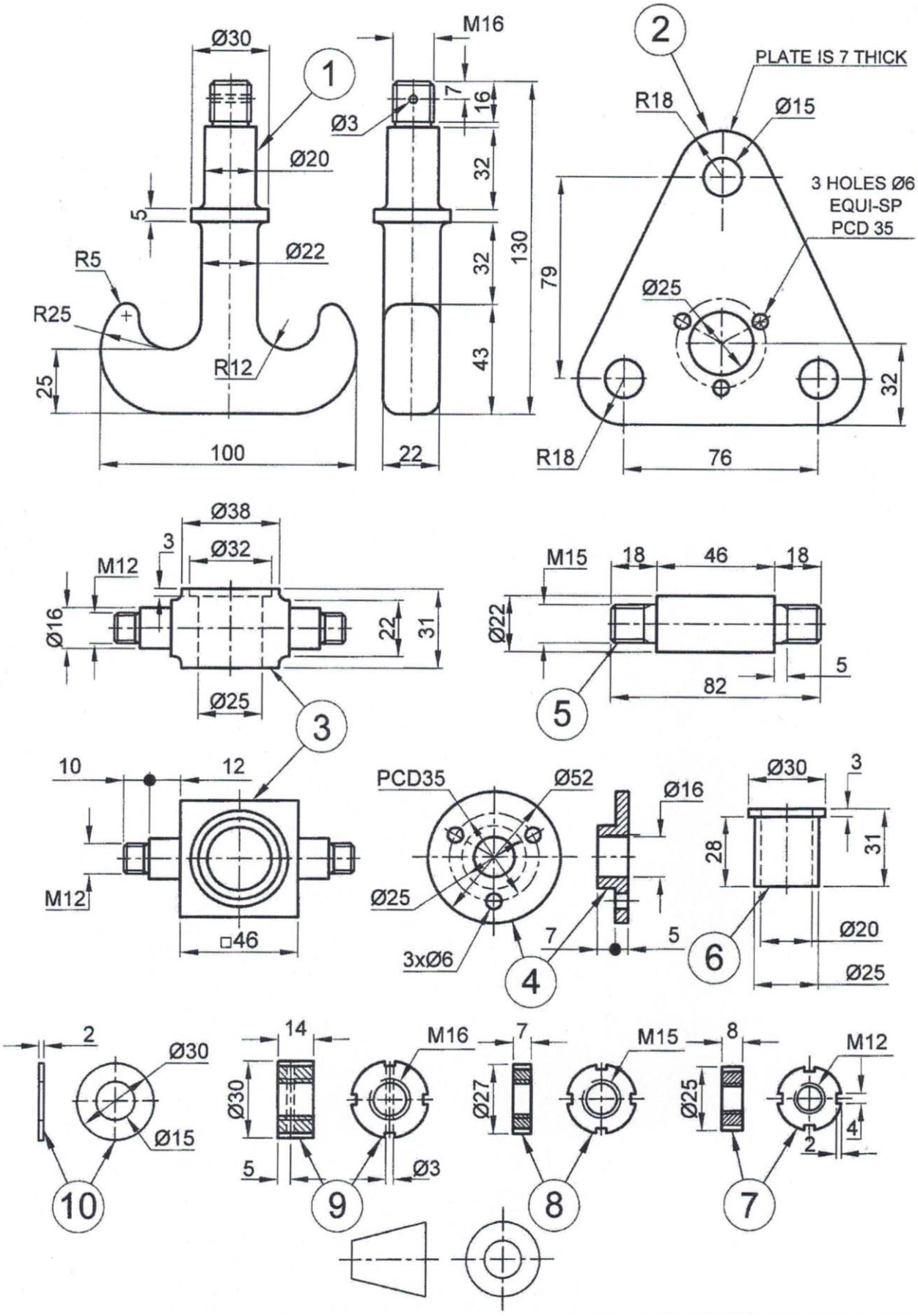


FIGURE 4

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