



higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T1090(E)(A3)T

**NATIONAL CERTIFICATE: MULTI-DISCIPLINARY DRAWING
OFFICE PRACTICE**

MECHANICAL DRAUGHTING N4

(8090204)

**3 April 2017 (X-Paper)
09:00–13:00**

CLOSED-BOOK EXAMINATION

REQUIREMENTS: ONE A2 drawing paper

Calculators and drawing instruments may be used.

This question paper consists of 9 pages.

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REPUBLIC OF SOUTH AFRICA
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PRACTICE
MECHANICAL DRAUGHTING N4
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 paper.
 5. A 15 mm border must be drawn on both sides of the drawing paper.
 6. ALL drawing work, including candidate information, must be done in pencil.
 7. ALL drawing work must conform to the latest SABS 0111 Code of Practice for Engineering Drawings.
 8. A radius curve stencil may be used to draw smaller arcs.
 9. Unspecified radii must be 3 mm.
 10. A balanced layout is important and candidates are advised to plan accordingly.
 11. Estimate ALL dimensions not shown in a reasonable proportion.
 12. Work neatly.
-

QUESTION 1: DISC CAM

Cams are found in most branches of engineering and are used to turn rotary motion into perpendicular lift away from the shaft.

You are required by your supervisor to draw, to scale 1 : 1, a full profile of a disc cam with the following specifications for a motor manufacturing company:

FOLLOWER: Knife-edge

CAM DATA

| | |
|---------------------------|---|
| Shaft diameter | 25 mm |
| Minimum diameter | 35 mm |
| Stroke height (lift/fall) | 45 mm |
| Performance | Rises 45 mm in the first 150° of cam rotation according to constant velocity Dwells for the next 60° of cam rotation Falls 45 mm in the next 150° of cam rotation according to constant velocity Cam rotation is clockwise |

Show the displacement diagram and ALL construction lines. The displacement diagram must be drawn on the left-hand side of the cam profile.

NOTE: The knife-edge follower need not be drawn.

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QUESTION 2: COMPRESSION SPRING

Motion in machines can be controlled by a helical compression spring.

As the design technician of your company you have to prepare the working drawing for a right-hand helical compression spring.

Using the following data draw, to scale 1 : 1, the outside front view of the spring according to conventional representation:

SPRING DATA

| | |
|------------------|--------|
| Outside diameter | 60 mm |
| Lead | 14 mm |
| Free length | 130 mm |
| Wire size | 6 mm |

[10]

QUESTION 3: SECTIONAL DRAWING

FIGURE 1 on the next page shows two views of a machine casting.

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

- Sectional front view on cutting plane X–X (10)
- Sectional right view on cutting plane Y–Y (8)

Insert ONLY the following symbols and dimensions on the drawing:

At A: A surface texture with a roughness value of 4,5 micrometres must be produced without removal of material. (2)

At B: A 32 mm diameter hole with an upper deviation of 15 micrometres and a lower deviation of 0 micrometres (2)

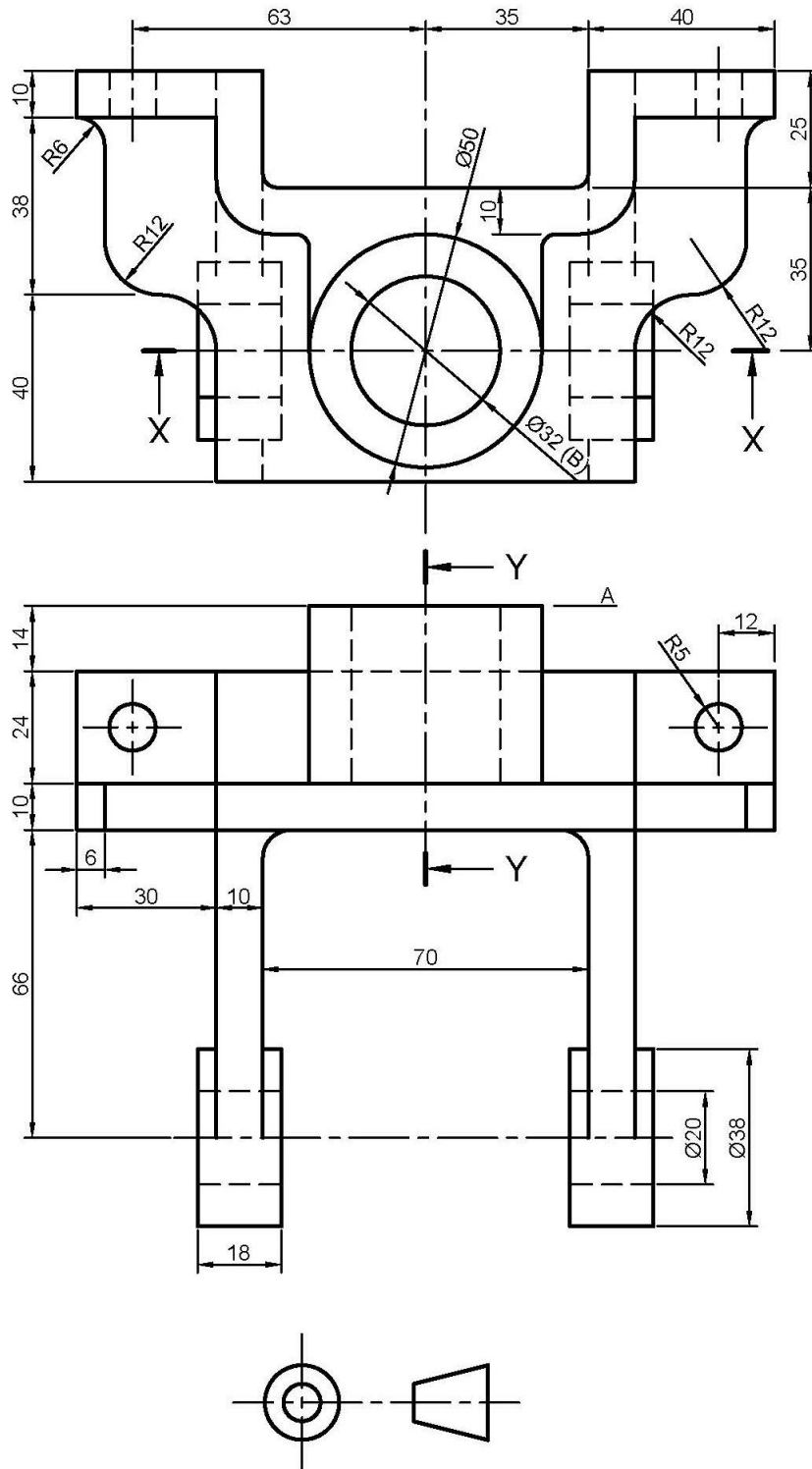


FIGURE 1

[22]

QUESTION 4: DETAIL DRAWING

FIGURE 2 on the next page shows two views of a cylinder head which consists of the following:

| ITEM | DESCRIPTION |
|------|------------------------|
| 1 | End cover |
| 2 | Cylinder |
| 3 | Cover |
| 4 | Valve |
| 5 | Helical spring |
| 6 | M24 hexagon-head screw |
| 7 | M16 hexagon-head screw |

Draw, to scale 1 : 2 and in first-angle orthographic projection, detail drawings of the following components:

- 4.1 End cover (item 1) showing a front view (8)
- 4.2 Cover (item 3) showing the following:
- Half-sectional front view with the top half in section (6)
 - Left view (6)

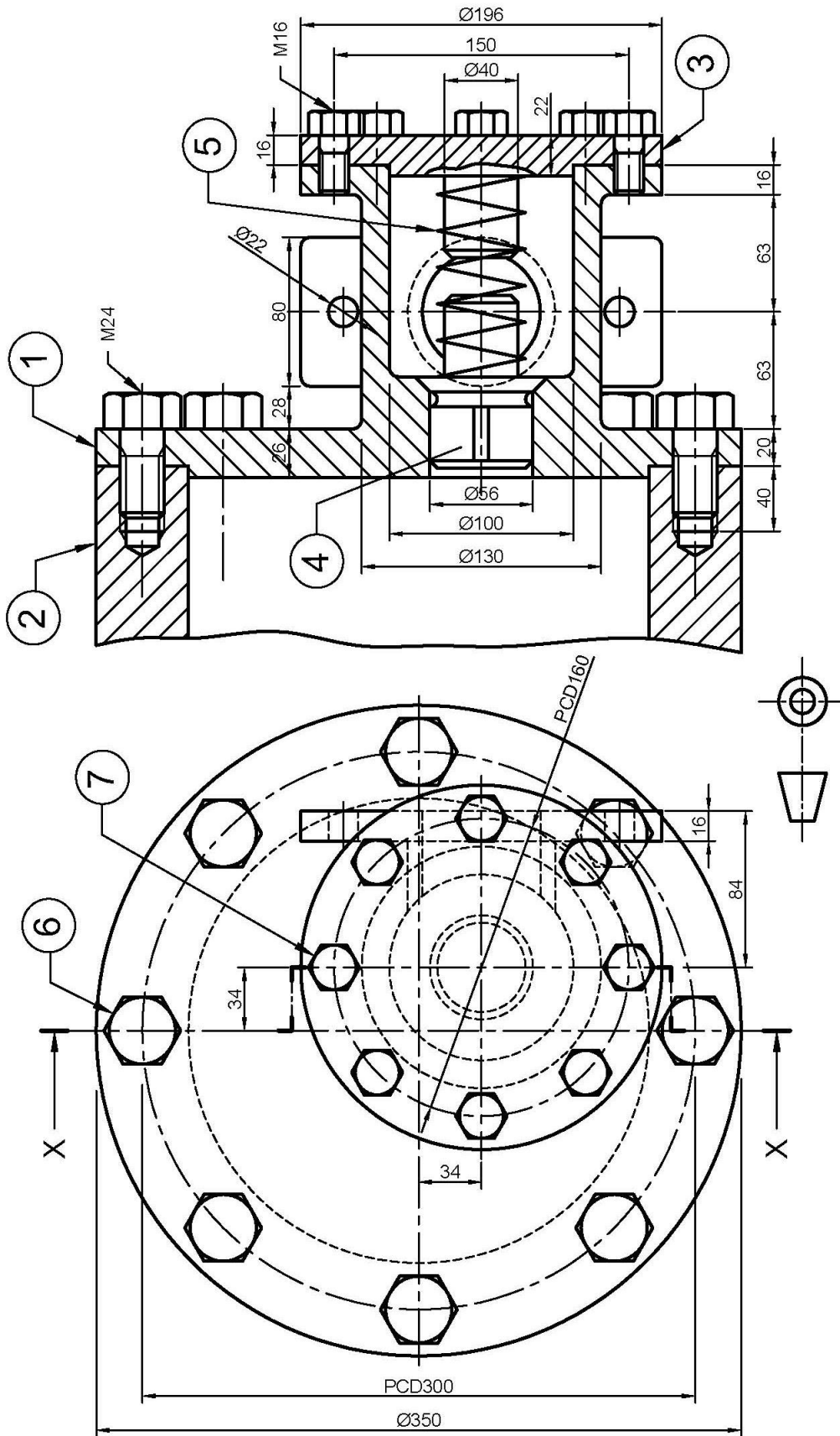


FIGURE 2

[20]

QUESTION 5: ASSEMBLY DRAWING

FIGURE 3 on the next page shows the components of a swivel pulley bolted to a concrete ceiling.

The complete list of parts is as follows:

| ITEM | PART | AMOUNT | MATERIAL |
|------|----------------------------|--------|--------------|
| 1 | Base | 1 off | cast steel |
| 2 | Fork | 1 off | mild steel |
| 3 | Pulley | 1 off | cast steel |
| 4 | Nut | 1 off | mild steel |
| 5 | Bolt | 1 off | mild steel |
| 6 | Single-thrust ball bearing | 1 off | chrome steel |
| 7 | Hexagon nut | 1 off | mild steel |

Make an assembly drawing to scale 1 : 1 of the swivel pulley in the normal working position showing a half-sectional front view with the right half in section.

Item numbers must be indicated on the assembly drawing.

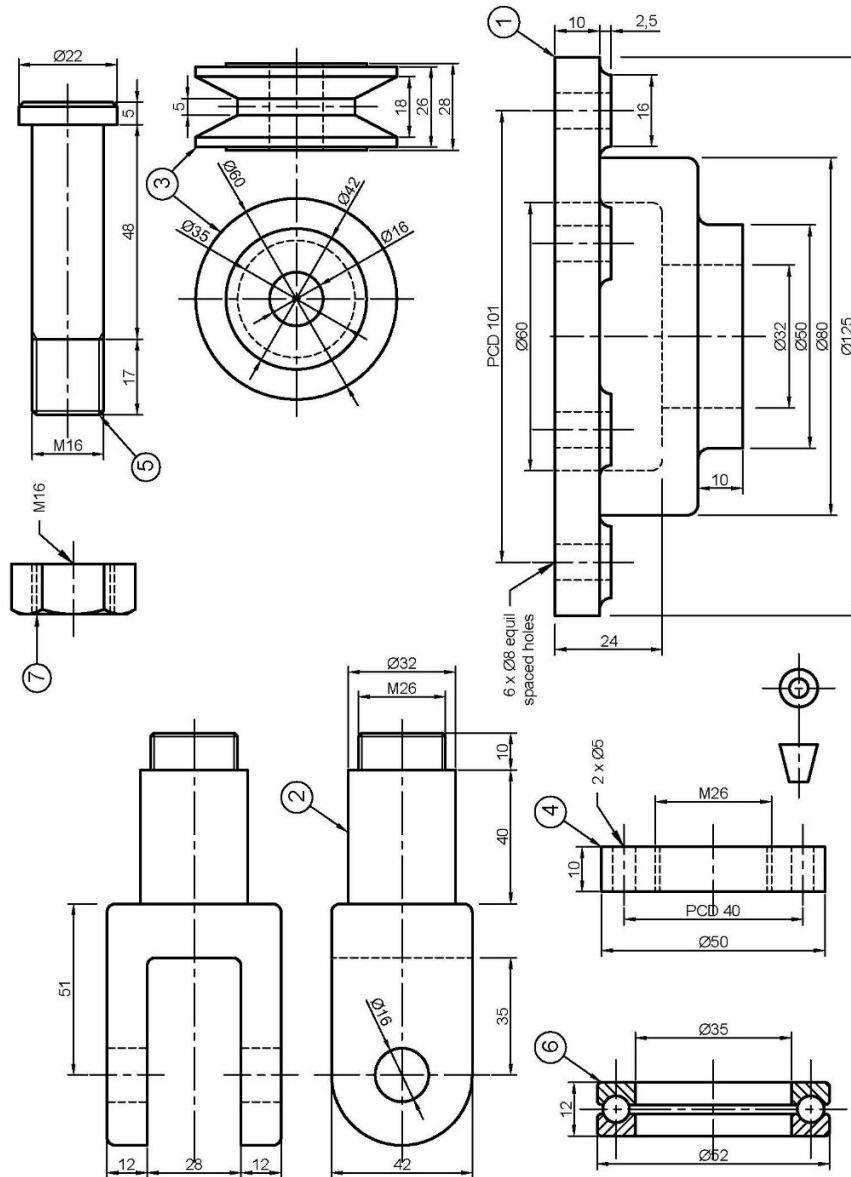


FIGURE 3

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Layout, neatness and general impression of ANSWER SHEET

[5]

TOTAL: 100