LEAVING CERTIFICATE EXAMINATION, 1999

3813

TECHNICAL DRAWING - HIGHER LEVEL

PAPER II(A) - ENGINEERING APPLICATIONS

Monday, 21 June, Afternoon 2.00 – 5.00 pm

200 Marks

INSTRUCTIONS

(a) Answer four questions.
(b) All questions carry equal marks.
(c) Drawings and sketches should be in pencil unless otherwise stated.
(d) Where dimensions are omitted they may be estimated.
(e) Credit will be given for neat orderly presentation of work.
(f) Candidates should work on one side of the paper only.
(g) The Examination Number should be written on each drawing sheet used.
(h) All dimensions are in millimetres.

---

1. Details of a Cam Assembly are given in Fig. 1 with the parts list tabulated below.

(a) Draw a full size sectional elevation A-A showing the parts fully assembled.

(b) Insert item reference numbers to identify the parts and add the title CAM ASSEMBLY.

(c) With the aid of a neat freehand sketch suggest a modification to the design which will ensure that the spherical end of the cam follower (Part 7) maintains contact with the camshaft (Part 5) at all times.

PART	NAME	REQUIRED
1	HOUSING	1
2	KEY	1
3	BUSH	2
4	FOLLOWER BUSH	1
5	CAMSHAFT	1
6	PULLEY	1
7	CAM FOLLOWER	1

OVER →

2. **(a)** The mechanism shown in Fig. 2(a) is pin-jointed. The crank OA rotates clockwise about fixed point O at constant speed and the link DB oscillates about fixed point D. The piston C moves vertically.

(i) Draw the mechanism and plot the locus of the mid-point of link AB for one complete revolution of OA.

(ii) Measure and dimension on your drawing the angle through which the link DB travels **and** the length of stroke of the piston C.

(b) The profile of a cam with a 12mm diameter in-line follower is given in Fig. 2(b). Draw the given profile and the cam displacement diagram using a scale of 5mm to represent 15° of cam rotation. Suggest the direction of rotation and state the reason for your choice.

3. **(a)** Draw or sketch a gear-type oil pump. Indicate on the drawing the direction of rotation of the gears and the flow direction through the pump.

(b) A sectional elevation of a compound gear assembly is shown in Fig. 3. Given the following data, calculate the main sizes for the gears, and draw the following views of the assembly:

(i) The given sectional elevation;

(ii) An end elevation, in the direction of arrow E, using standard conventional representation.

Insert the following dimensions on the gears where applicable:- addendum, dedendum, pitch circle diameter, addendum circle diameter, dedendum circle diameter, pitch cone angle, back angle.

Spur Gear Data	
Involute teeth	
Module	4
Pressure Angle	20°
Number of teeth	32
Face width	30mm

Straight Mitre Bevel Gear Data	
Involute teeth	
Module	5
Pressure Angle	20°
Number of teeth	19
Face width	22mm

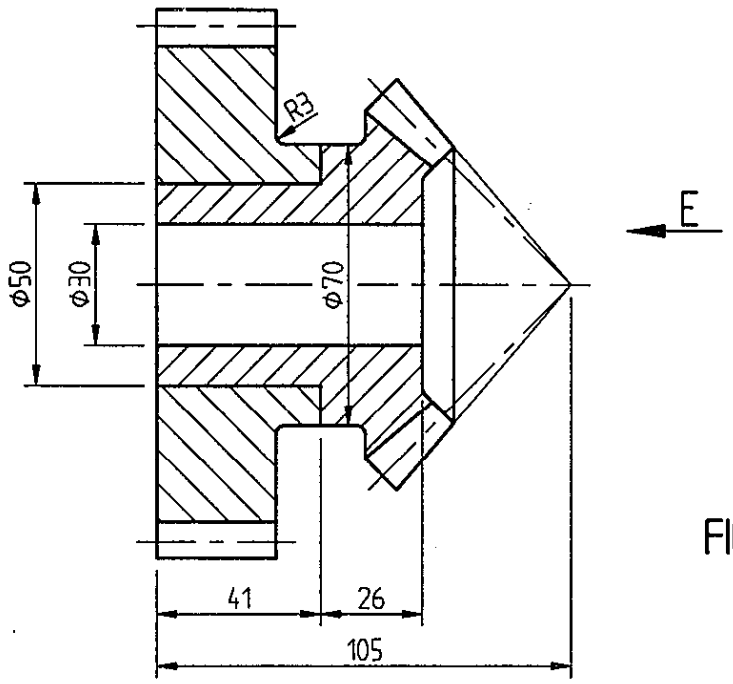


FIG. 3

4. The elevation and plan of a square to rectangle transition piece are shown in Fig. 4.

(a) Draw the given views and produce a one piece surface development of the transition piece. The development should have the shortest seam possible.

(b) Measure and state the value of the fold angle between the surfaces A and B.

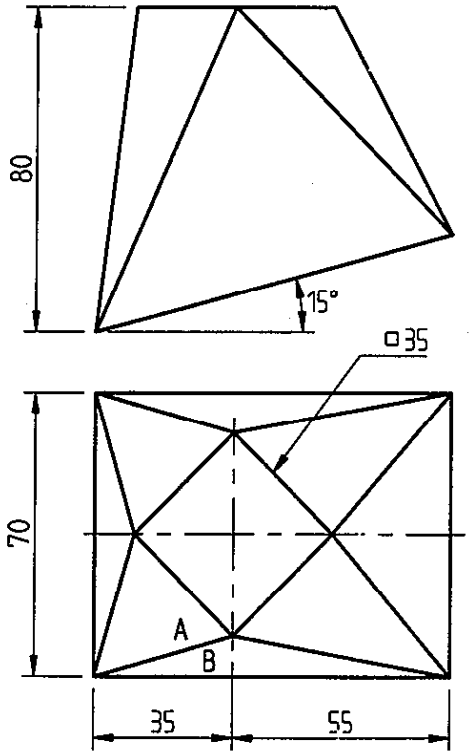


FIG. 4

5. Drawings of a Cast Iron Bracket, in first angle projection, are shown in Fig. 5.

(a) Draw the following views of the bracket in either first or third angle projection:

(i) The given elevation which contains the cutting plane;
(ii) An auxiliary elevation in section on X-X.

(b) Insert the following on the drawing:

(i) Six dimensions, including a diameter and a radius.
(ii) The appropriate ISO projection symbol.
(iii) A symbol to indicate that the surface Z is to be machined on a milling machine; surface texture N7.
(iv) Limits of size on the diameter 66 H8 bore. Table of limits and fits is given below.
(v) Title: CAST IRON BRACKET.

OVER	TO	H9	e9	H8	f7
mm	mm	0.001 mm	0.001 mm	0.001 mm	0.001 mm
30	50	+ 62 0	- 50 - 112	+ 39 0	- 25 - 50
50	80	+ 74 0	- 60 - 134	+ 46 0	- 30 - 60

OVER →

6. **Answer SECTION A or SECTION B but not both.**

SECTION A

(a) Fig. 6(a) details the connection of the horizontal ties and the vertical sag tie of a roof truss, which is made from equal size angle iron and a 6mm thick gusset plate. The toe and root radii of the angle iron are 2mm and 9mm respectively. Draw, scale 1:1, the following:

(i) The elevation of the connection as given;
(ii) A side elevation, in the direction of arrow A.

Show all hidden detail. Dimensions are not required.

(b) Produce a neat freehand sectional sketch showing the construction of a piston typical of the type used in any common internal combustion engine. Show clearly how leakage past the piston is prevented, and how the gudgeon pin is prevented from moving end wise and scoring the cylinder walls.

OR

SECTION B

(a) Fig. 6(b) shows the main window of a CAD system, with 10 parts identified with item reference numbers 1 to 10. Match each of the numbered items with the correct term from the following selection:

Drawing title;	*Toolbar;*	*Up scroll arrow;*	*Crosshairs/Cursor;*
Screen menu;	*Menu bar;*	*Command window;*	*Graphics window;*
World co-ordinate system icon;		*Co-ordinate display.*	

(b) Draw, full size, the object that would be displayed on a CAD system when the following commands are executed. All points (X, Y) are specified using absolute co-ordinates. The origin (0,0) is at the lower left corner of the display.

- Sheet size is set. Lower left corner (0,0) and (210,148) upper right corner.
- Lines are drawn from point A (100,30), to point B (50,30), to point C (50,70), to point D (80,100), to point E (80,120) and to point F (100,120).
- The five lines drawn are selected and mirrored about a mirror line. The first point on the mirror line is at (100,30) and the second point is at (100,120). The old object is not deleted.
- A polygon is drawn, number of sides 4, centre point (100,60), inscribed in a circle of radius 20mm.

(c) With the aid of sketches and a brief note distinguish clearly between:

(i) A plotter and a digitizer;
(ii) A polar array and a rectangular array;
(iii) An associative dimension and a parametric dimension.

(d) Fig. 6(b)1 shows a drawing of a poppet valve. Sketch how a three-dimensional model of this would be represented using **(i)** wire-frame modelling **(ii)** solid modelling, and state **two** advantages that solid modelling offers compared with wire-frame modelling.

(e) List the commands you would use, in the sequence that you would use them, to convert the drawing shown in Fig. 6(b)2 into the drawing shown in Fig. 6(b)3.

AN ROINN OIDEACHAIS AGUS EOLAÍOCHTA M.84(L)

SCRÚDÚ ARDTEISTIMÉIREACHTA

1999

LÍNÍOCHT THEICNIÚIL - ARDLEIBHÉAL

PÁIPÉAR II(A)

FEIDHMIÚCHÁIN INNEALTÓIREACHTA

AN ROINN OIDEACHAIS AGUS EOLAÍOCHTA

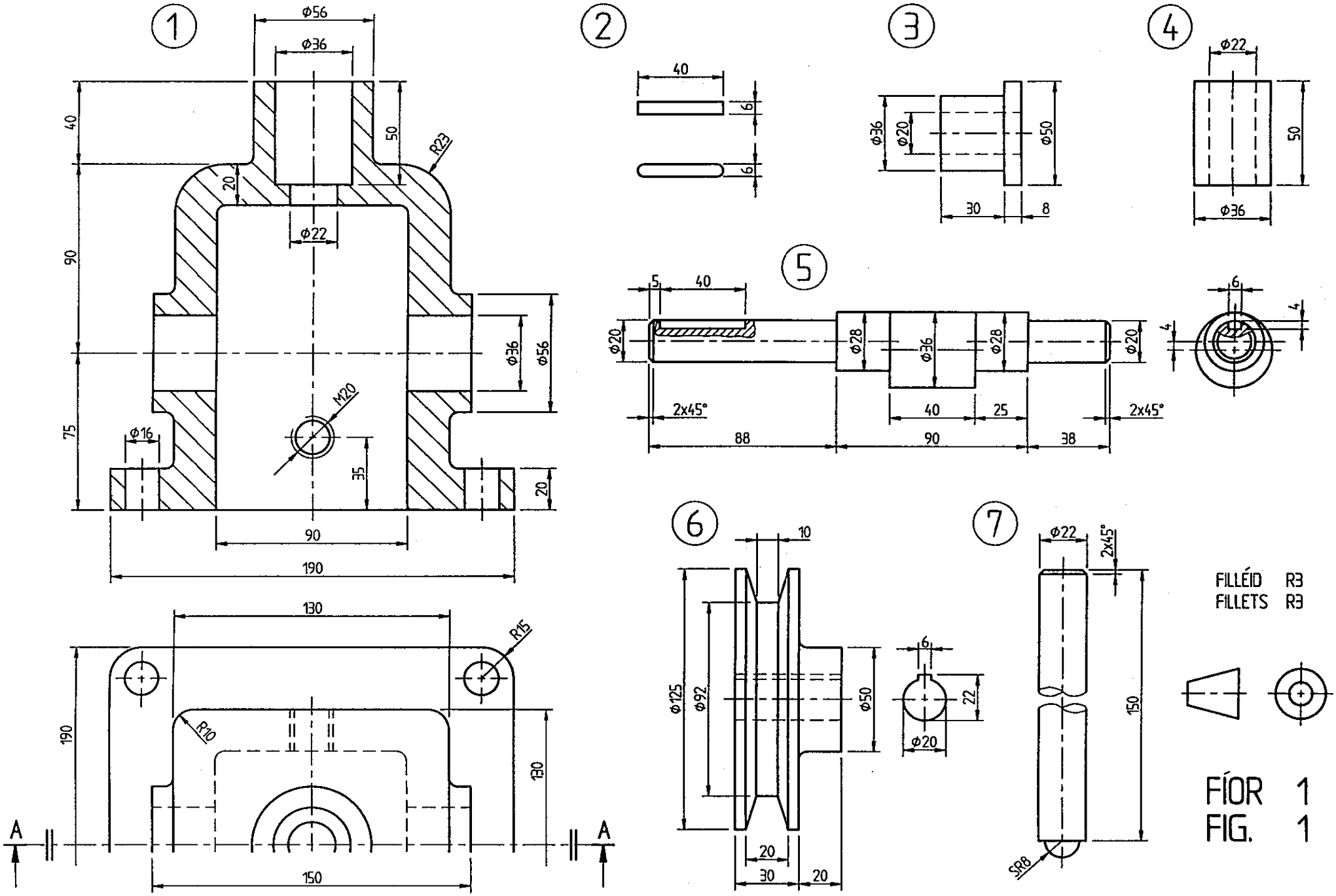
LEAVING CERTIFICATE EXAMINATION

1999

TECHNICAL DRAWING - HIGHER LEVEL

PAPER II(A)

ENGINEERING APPLICATIONS


1
ϕ56
ϕ36
40
50
R23
20
ϕ22
90
ϕ36
ϕ56
M20
75
ϕ16
35
20
90
190
130
R15
190
R10
130
A
A
150
2
40
6
6
3
ϕ36
ϕ20
ϕ50
30
8
4
ϕ22
50
ϕ36
5
5
40
ϕ20
ϕ28
ϕ36
ϕ28
ϕ20
2x45°
40
25
2x45°
88
90
38
6
4
4
6
ϕ125
ϕ92
ϕ50
6
22
ϕ20
20
30
20
7
ϕ22
2x45°
150
SR8
FILLÉID R3
FILLETS R3
FÍOR 1
FIG. 1

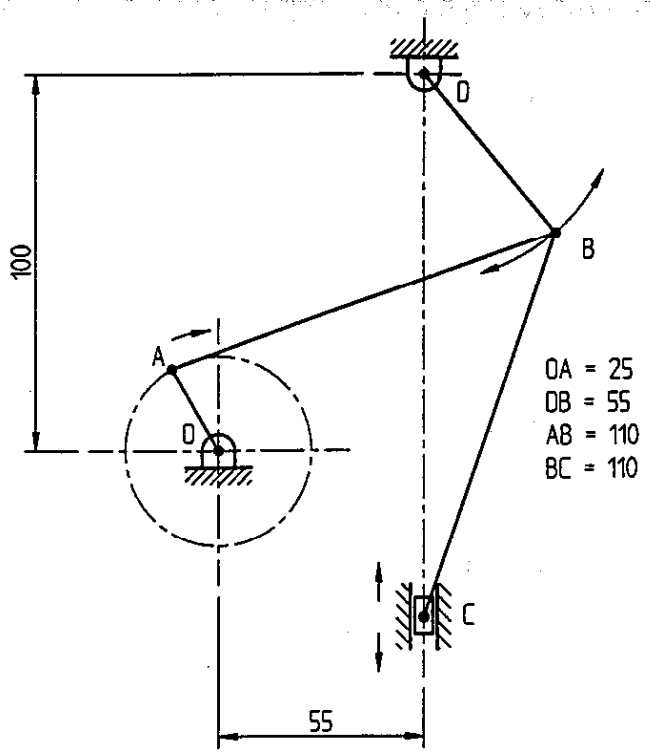


FIG. 2(a) FÍOR 2(a)

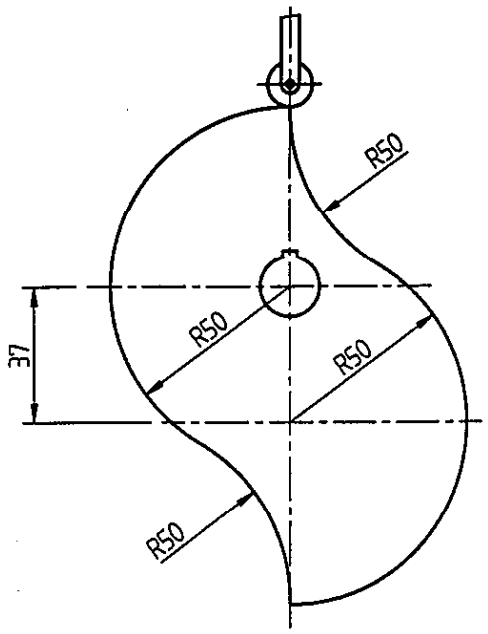


FIG. 2(b) FÍOR 2(b)

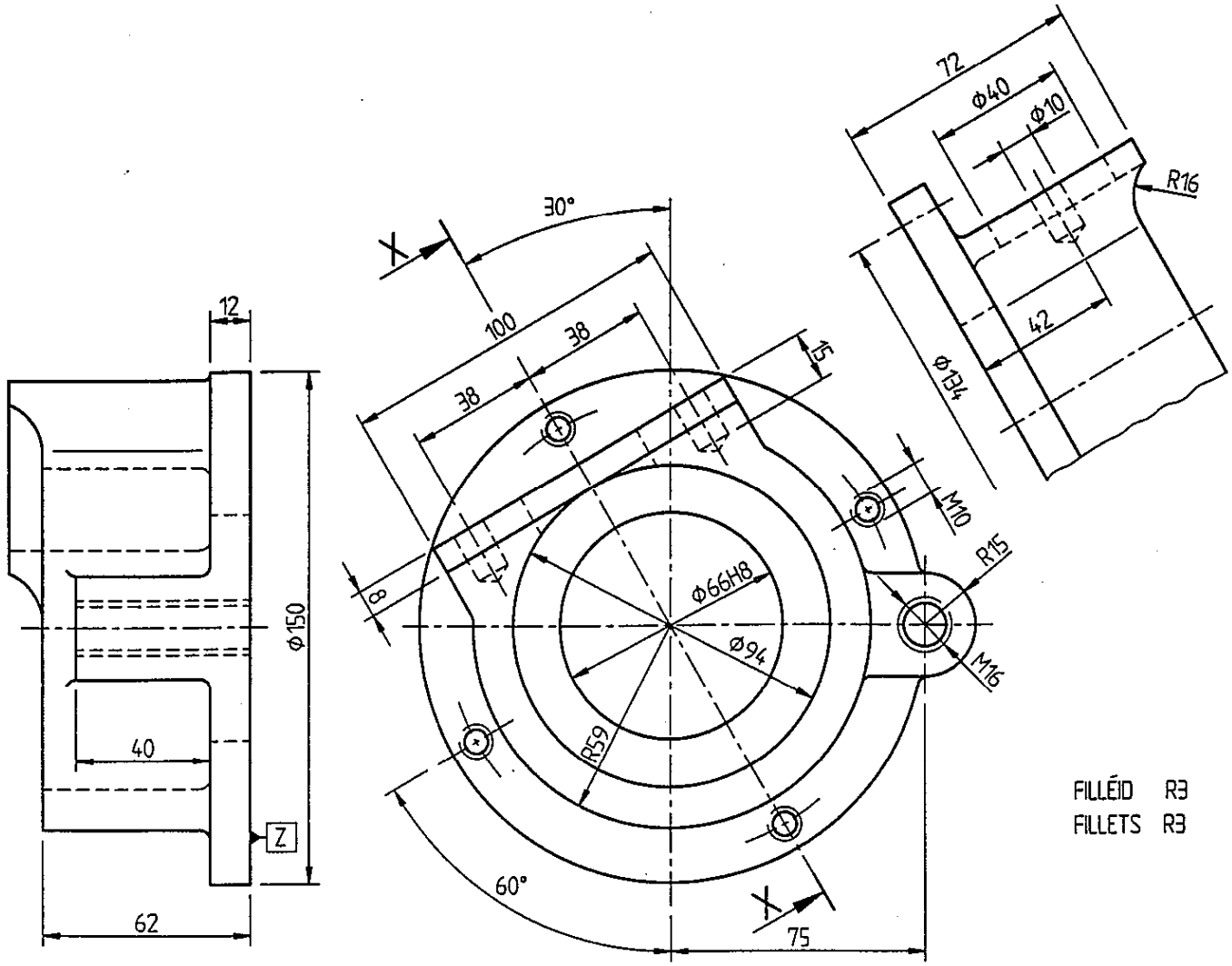


FIG. 5 FÍOR 5

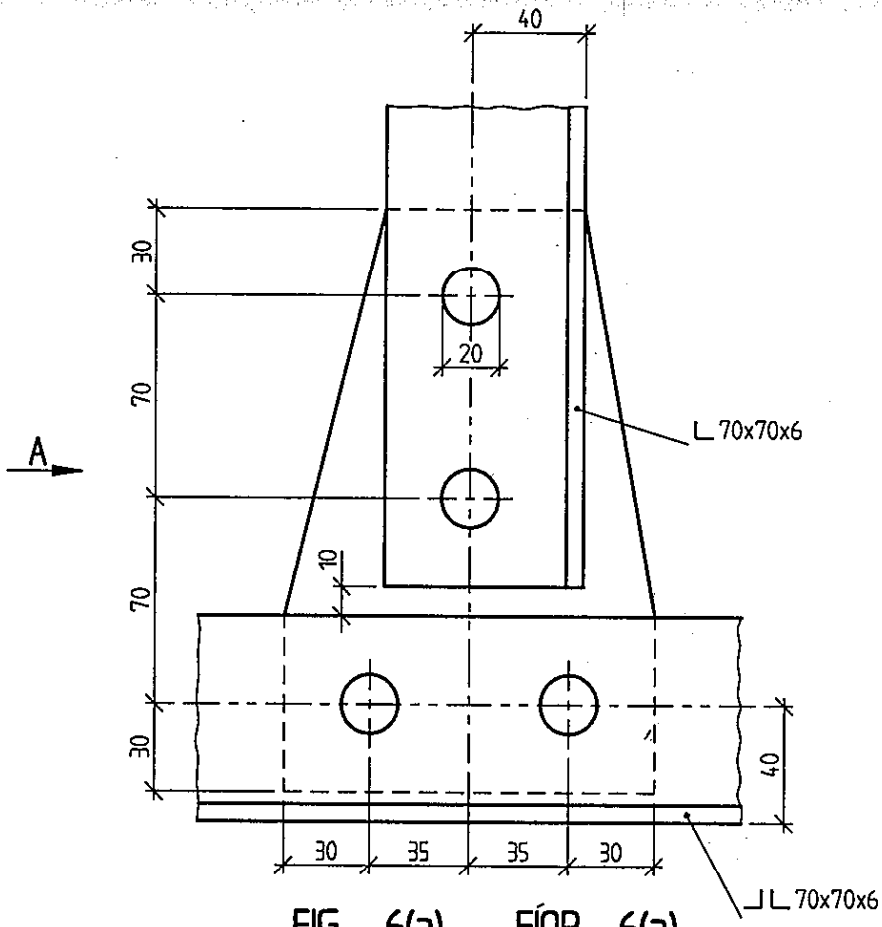


FIG. 6(a) FÍOR 6(a)

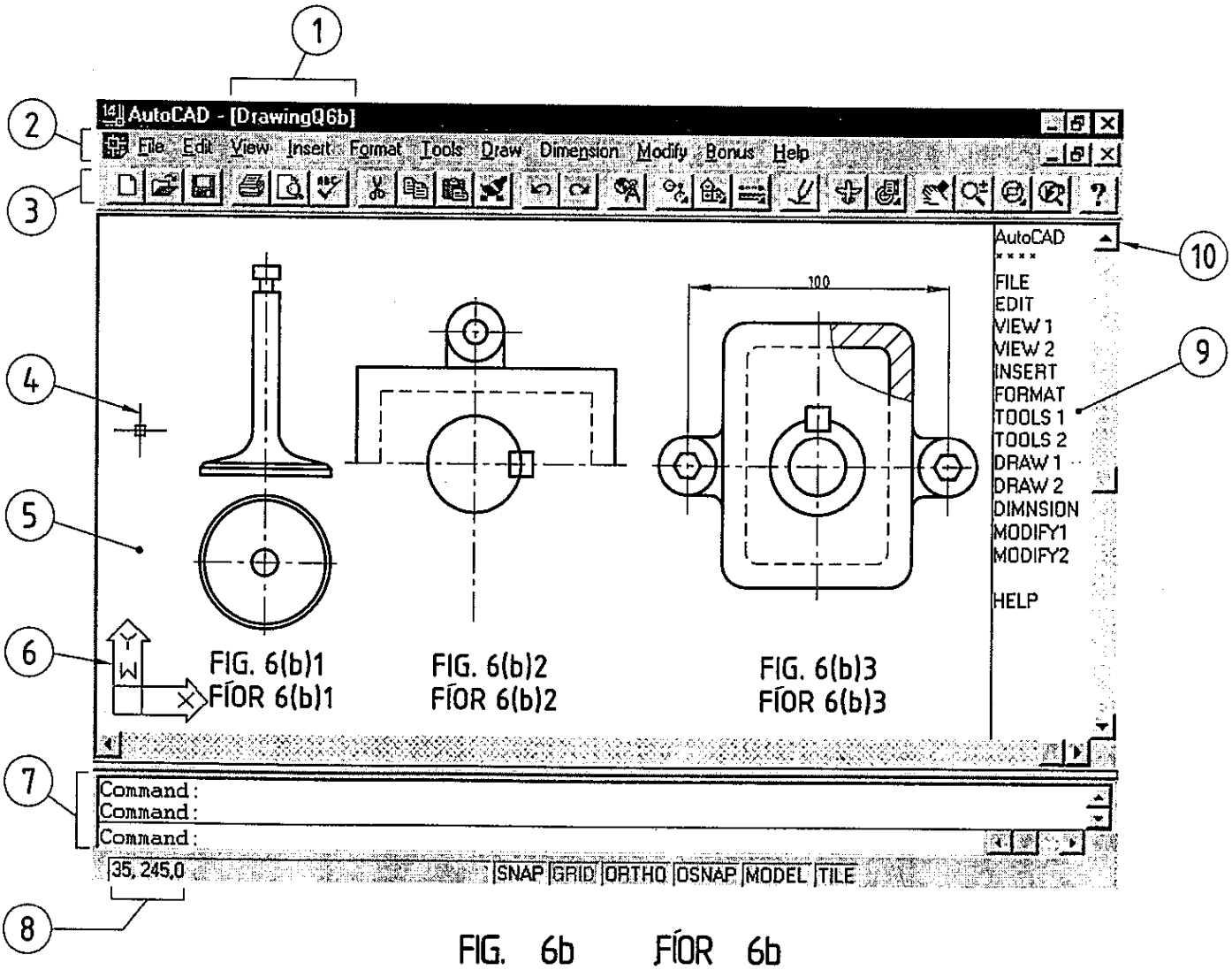


FIG. 6(b)1 FÍOR 6(b)1

FIG. 6(b)2 FÍOR 6(b)2

FIG. 6(b)3 FÍOR 6(b)3

FIG. 6b FÍOR 6b