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LEAVING CERTIFICATE EXAMINATION, 2002

TECHNICAL DRAWING - HIGHER LEVEL

PAPER II(A) - ENGINEERING APPLICATIONS

Friday 14 June, Afternoon 2.00 - 5.00 pm

200 Marks

NSTRUCTIONS

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

1. Details of a Rail-Transport Hanger 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 RAIL-TRANSPORT HANGER.

(c) With the aid of a neat freehand sketch suggest a modification to the design which will allow lubrication of the bush (Part 6).

PART	NAME	REQUIRED
1	HANGER BRACKET	1
2	EYEBOLT	1
3	WHEEL	1
4	M16 HEX.NUT	1
5	M16 WASHER	1
6	BUSH	1
7	SHAFT	1

2. Drawings of a cylinder cover, in first angle projection, are shown in Fig. 2.

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

(i) A sectional elevation on A-A;

(ii) A sectional plan on B-B.

Insert on the drawing the title CYLINDER COVER and appropriate projection symbol.

(b) Sketch freehand, in good proportion on your drawing sheet, a large neat sectional isometric view of the portion of the cylinder cover that remains when cut on the section planes A-A and B-B. The portions of the cover in front of plane A-A and above plane B-B are removed and discarded. Make corner X the lowest point in your sketch and hatch the cut surfaces.

3. **(a)** Fig. 3 shows a spur gear train. Draw the following table on your sheet and complete it by inserting the missing gear train information.

GEAR	TEETH	MODULE	PCD	ROTATION	SPEED RPM
A	36	6		Clockwise	300
B	12				
C	24				

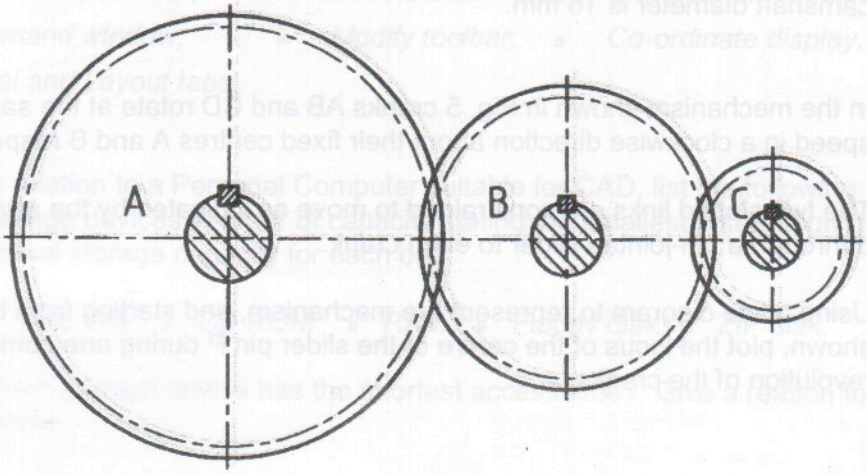


FIG. 3

(b) An involute gear wheel with 24 teeth, 20° pressure angle and module 10 is in mesh with a rack. Draw, full size, the gear and rack in mesh, showing one tooth on the gear and two teeth on the rack.

Tabulate on the sheet the following values for the gear wheel:

Addendum circle diameter, Dedendum circle diameter, Pitch circle diameter, Base circle diameter, Circular pitch and Tooth thickness.

(c) Make a neat sketch, either freehand or with the aid of instruments, of a sectional elevation of a typical bevel gear and indicate clearly on the sketch the following gear terms and features:

Pitch diameter, Cone distance, Face width, Addendum, Dedendum, Pitch cone angle, Back cone angle.

4. The elevation and plan of a thin sheetmetal transition piece is shown in Fig. 4.

(a) Draw the given views and produce a one piece surface development of the transition piece with the seam at SS.

(b) Make large sectional freehand sketches of the following:

(i) Wired edge;

(ii) Grooved seam joint;

(iii) 'S'-type slip joint.

5. **(a)** Draw the profile and displacement diagram for a plate cam rotating in a clockwise direction and imparting, to an in-line roller follower of 20 mm diameter, the following motion:

0° to 60°	Dwell.
60° to 240°	Rise 50 mm with uniform acceleration and retardation.
240° to 270°	Dwell.
270° to 360°	Fall 50 mm with simple harmonic motion.

The nearest approach of the roller centre to the cam centre is 35 mm. The camshaft diameter is 16 mm.

(b) In the mechanism shown in Fig. 5 cranks AB and CD rotate at the same constant speed in a clockwise direction about their fixed centres A and B respectively.

The two slotted links are constrained to move as indicated by the arrows and are attached through a pin-jointed slider to each crank.

Using a line diagram to represent the mechanism, and starting from the position shown, plot the locus of the centre of the slider pin P during one complete revolution of the cranks.

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

SECTION A

(a) A sectional view of a cam operated pump assembly, with the pump completing the delivery stroke, is shown in Fig. 6(a).

(i) Make a large neat FREEHAND sketch of the sectional view of the assembly showing the pump on the suction stroke with the camshaft, diaphragm and valves, in their correct working position.

(ii) Identify and neatly label on the sketch the following parts: Camshaft, Diaphragm, Inlet port, Suction valve, Delivery valve and Cheese head screw.

(iii) With the aid of arrows, show the direction of flow through the pump.

(iv) State a typical application for the pump.

(b) Sketch freehand the following:

(i) Castle nut;

(ii) External circlip;

(iii) Socket head screw.

OR

SECTION B

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

- *Pull-down menu bar,*
- *Status Bar,*
- *Restore window button,*
- *Object snap toolbar,*
- *Save button,*
- *Undo button,*
- *Command window,*
- *Modify toolbar,*
- *Co-ordinate display,*
- *Model and Layout tabs.*

(b) **(i)** In relation to a Personal Computer suitable for CAD, list the following storage devices in order of capacity stating the smallest first and giving a typical storage capacity for each one:

- Hard disk • CD ROM • RAM • Floppy disk • ZIP disk.

(ii) Which storage device has the shortest access time? Give a reason for your choice.

(c) **(i)** Fib. 6(b) 1 shows a drawing of a milled plate. Draw the table given in Fig. 6(b) 2 on your drawing sheet and complete it by giving the X and Y co-ordinates in ABSOLUTE tabulated format for each of the numbered corners 1 to 9. Corner number 1 has been entered for your guidance.

(ii) When the plate is rotated through 180° about the Z-axis, state the new ABSOLUTE co-ordinates of corners number 1 and 6.

(iii) How can the plate drawing be reduced to half its original size, using CAD commands?

(d) Explain briefly, with the aid of sketches, the purpose of the following CAD commands:

(i) TRIM **(ii)** MIRROR **(iii)** OFFSET **(iv)** LINETYPE SCALE.

(e) Make pictorial sketches to show the results of the following solid modelling operations:

(i) The profile in Fig. 6(b) 3 is revolved clockwise through 270° about the Y-Y axis of revolution.

(ii) The object in Fig. 6(b) 4 is extruded a height of 20 mm with a taper angle of 0°.

(iii) A union operation is applied to the penetrating cylinder and cone in Fig. 6(b) 5.

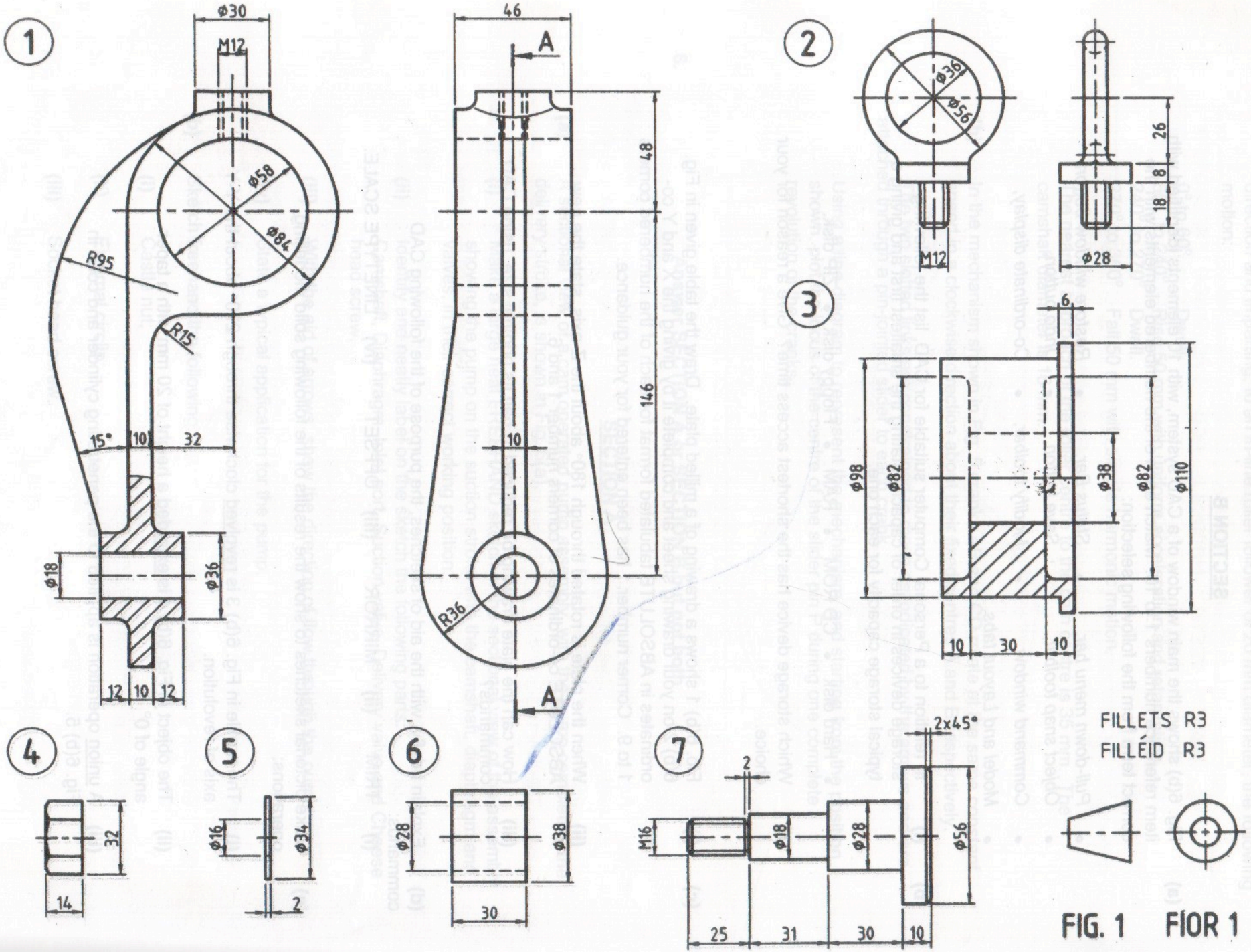
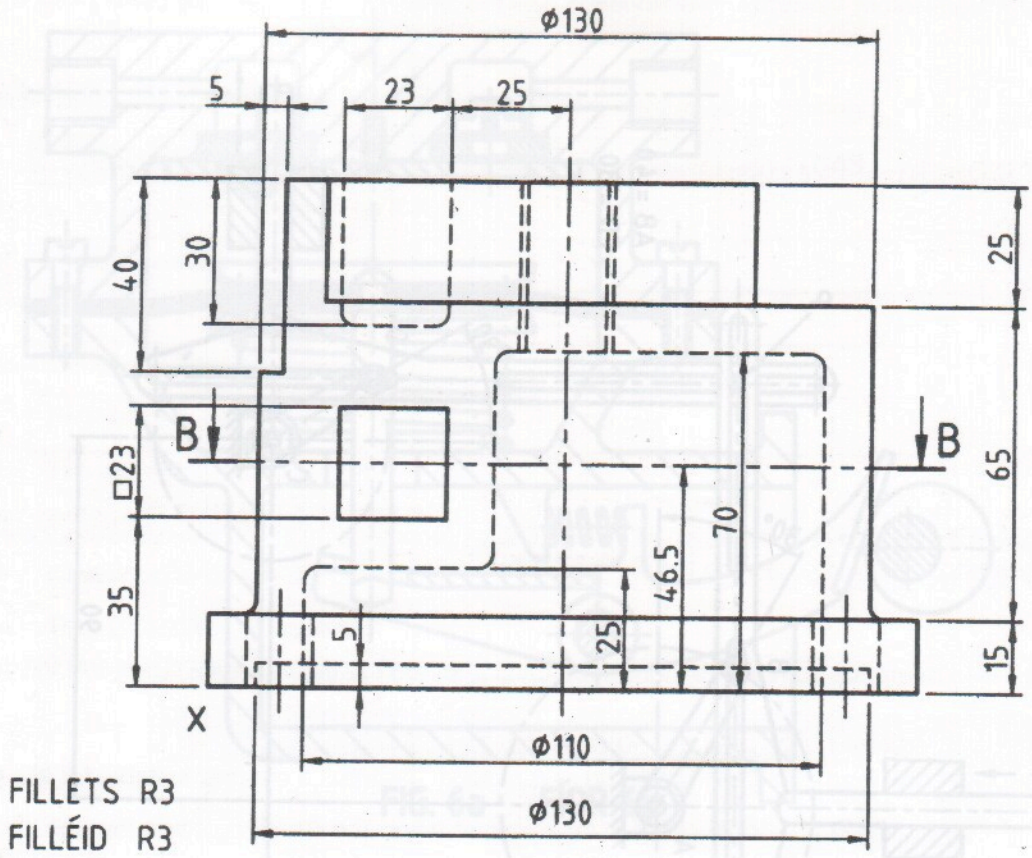

1
ø30
M12
ø58
ø84
R95
R15
15°
10
32
ø18
ø36
12
10
12
46
A
48
146
10
R36
A
2
ø36
ø56
M12
26
8
18
ø28
3
6
ø98
ø82
ø38
ø82
ø110
10
30
10
4
32
14
5
ø16
ø34
2
6
ø28
ø38
30
7
2x45°
2
M16
ø18
ø28
ø56
25
31
30
10
FILLETS R3
FILLÉID R3

FIG. 1 FÍOR 1


ø130
5
23
25
40
30
25
B
B
□23
65
70
46.5
35
5
25
15
X
ø110
ø130
FILLETS R3
FILLÉID R3

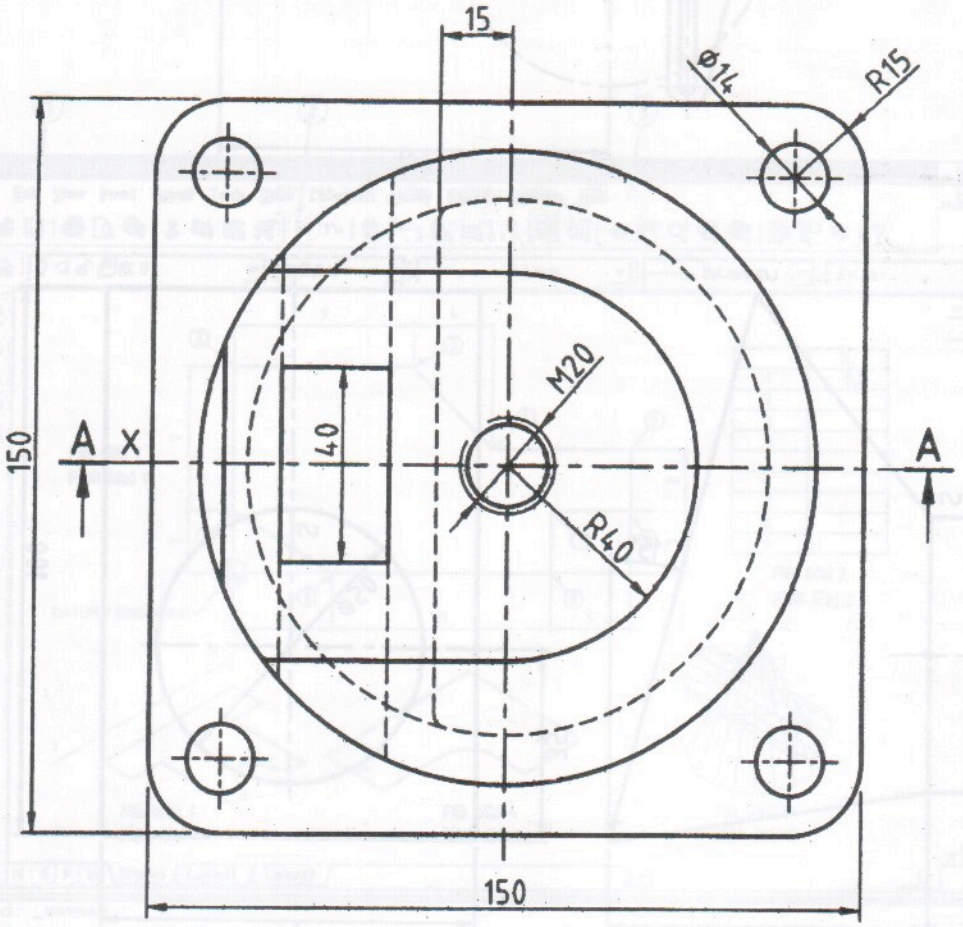

15
ø14
R15
M20
A
X
40
A
R40
150
150

FIG. 2 FÍOR 2

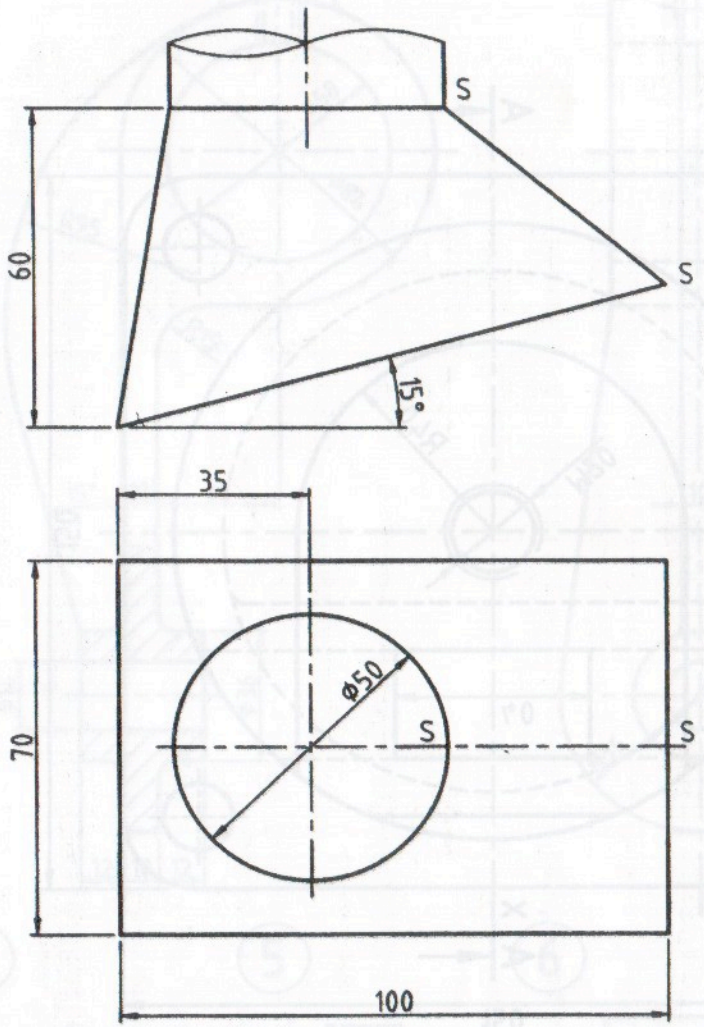


FIG. 4 FÍOR 4

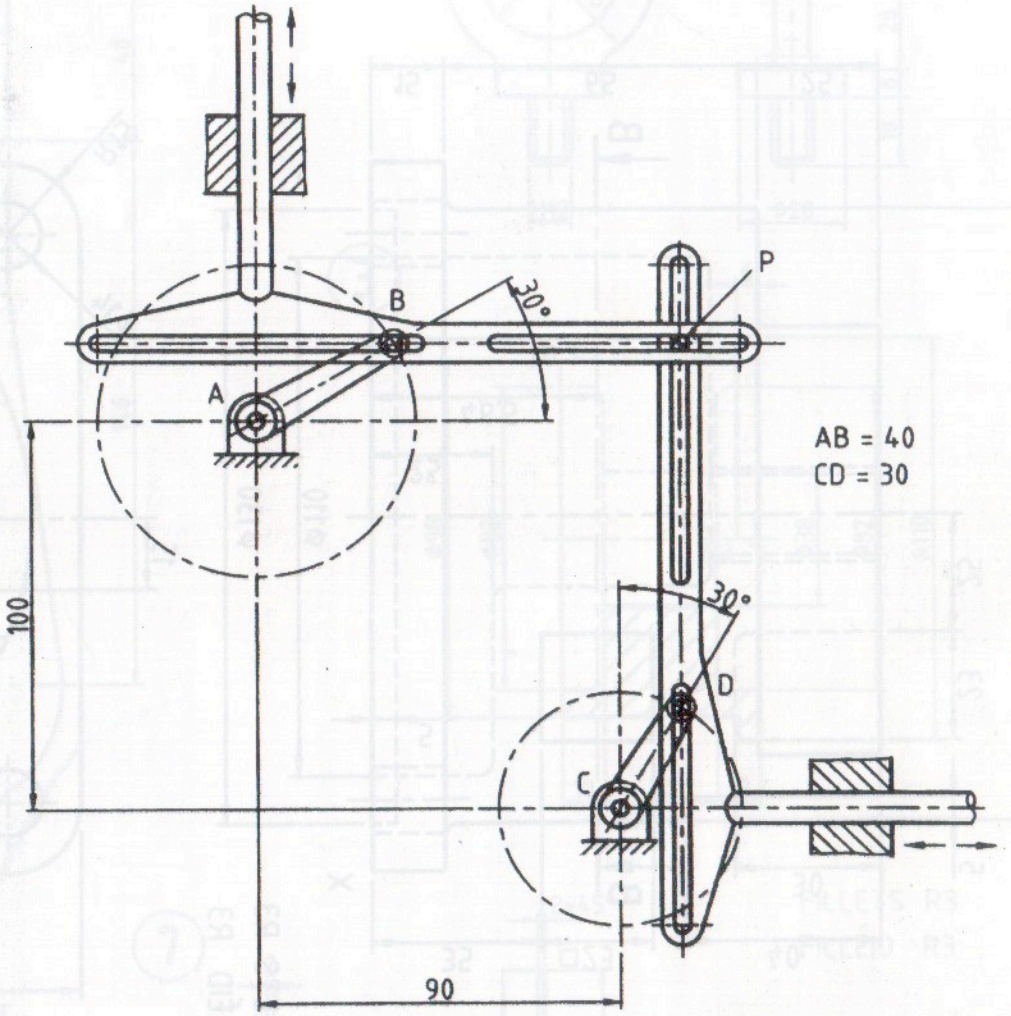


FIG. 5 FÍOR 5

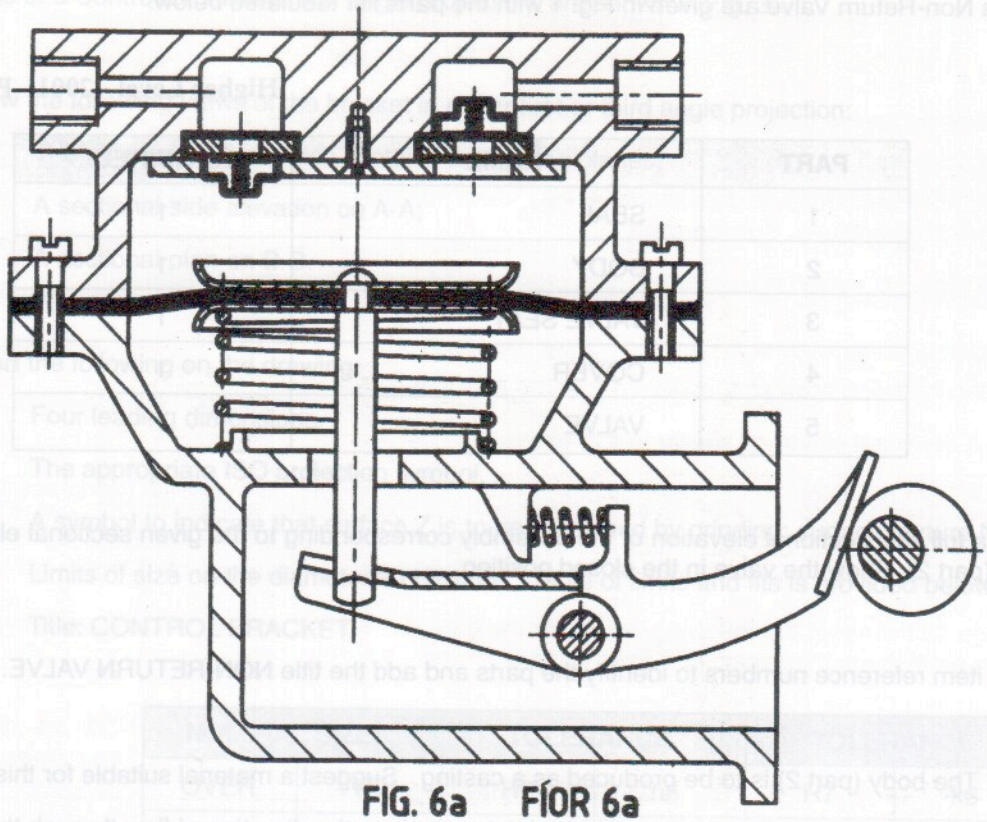


FIG. 6a FÍOR 6a

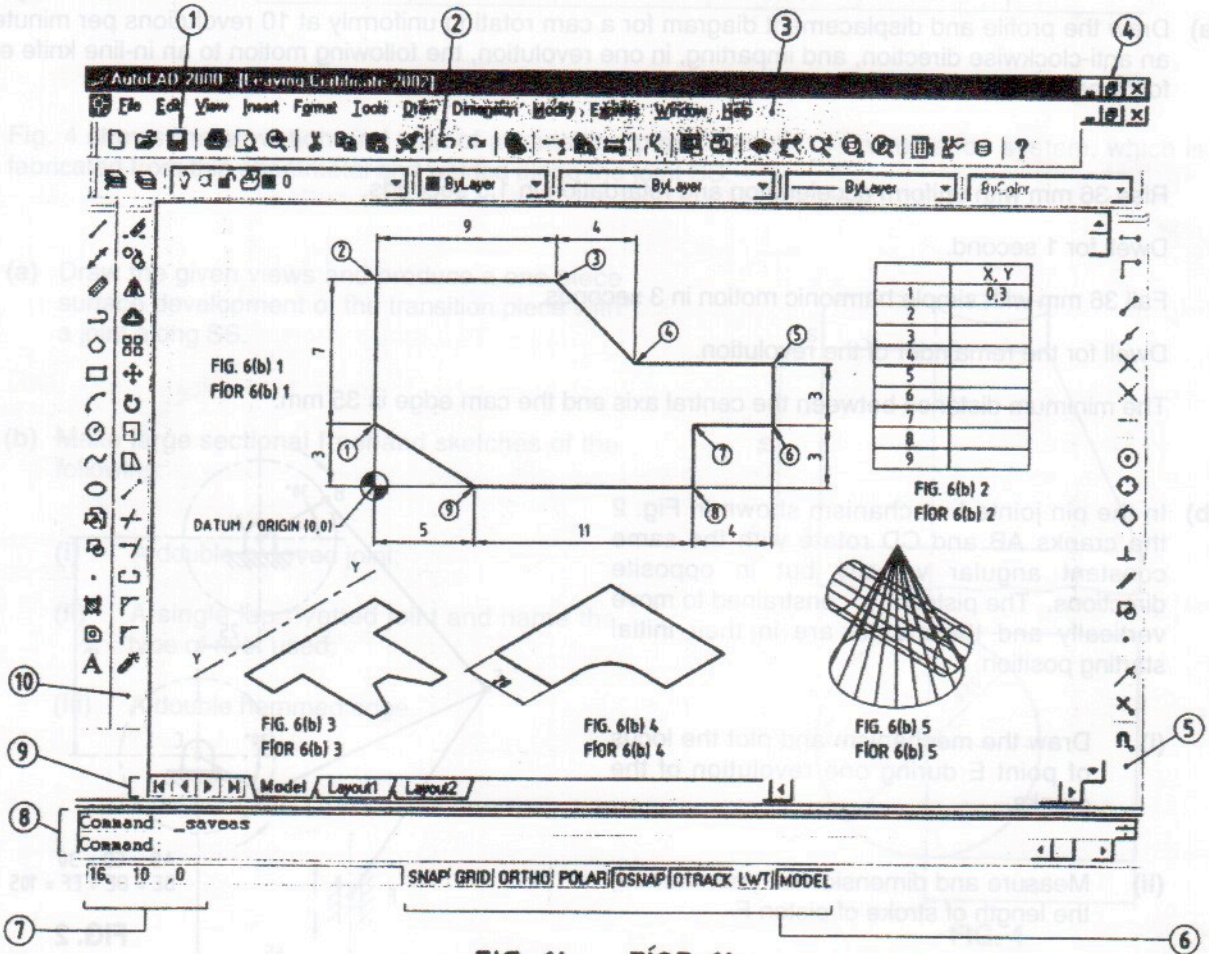


FIG. 6b FÍOR 6b