# AN ROINN OIDEACHAIS

## LEAVING CERTIFICATE EXAMINATION, 1996

## TECHNICAL DRAWING - HIGHER LEVEL

## PAPER II(A) - ENGINEERING APPLICATIONS

**MONDAY, 17 JUNE - MORNING, 9.30 to 12.30**

**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.

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**1.** Details of a Welding Fixture are given in Fig. 1 with a parts list tabulated below.

**(a)** Draw a full size sectional elevation S-S showing the parts completely assembled.

**(b)** Insert item reference numbers to identify the parts and add the title WELDING FIXTURE.

**(c)** A circlip is used to retain the spindle (Part 5) in position. Draw a neat freehand sketch of a circlip suitable for this purpose and include three functional dimensions. The sketch may be drawn to any suitable scale.

| INDEX | PART | REQUIRED |
|---|---|---|
| 1 | Body | 1 |
| 2 | Hinge | 2 |
| 3 | Jaw | 2 |
| 4 | Screw | 2 |
| 5 | Spindle | 2 |
| 6 | Circlip (Not shown) | 2 |

**OVER →**

**2.** A pictorial view of a camshaft pump is shown in Fig. 2 **on a separate page.**

**(i)** The leader lines on the drawing indicate the principal components of the pump. Name each of the components directly on the drawing in the spaces provided. The lettering should be in neat *drawing standard* block capitals.

**Add your examination number to the page and return it with your drawings in the envelope.**

**(ii)** With the aid of schematic (simple line) diagrams and brief notes, describe the operating cycle of the camshaft pump.

**(iii)** The valve A of the pump as shown is incomplete. Sketch this part of the pump separately in *orthographic projection*. Show on the sketch what modification, and/or additional parts, would be necessary to make the valve function as an inlet valve.

**3.** The elevation and side elevation of a Coupling Block are shown in Fig. 3.

**(a)** Draw a sectional elevation A-A and a sectional plan B-B of the Block.

**(b)** Insert the following on the drawing:

**(i)** Six leading dimensions.
**(ii)** ISO projection symbol.
**(iii)** Title: COUPLING BLOCK.
**(iv)** Symbol to indicate that the top surface (Z) must be machined on a milling machine; surface texture N7.
**(v)** Limits of size of the diameter 40 H7 bore. Table of limits and fits is given below.

| OVER | TO | H9 | e9 | H8 | f7 | H7 | g6 |
|---|---|---|---|---|---|---|---|
| mm<br>- | mm<br>3 | 0.001mm<br>+25<br>0 | 0.001mm<br>-14<br>-39 | 0.001mm<br>+14<br>0 | 0.001mm<br>-6<br>-16 | 0.001mm<br>+10<br>0 | 0.001mm<br>-2<br>-8 |
| 3 | 6 | +30<br>0 | -20<br>-50 | +18<br>0 | -10<br>-22 | +12<br>0 | -4<br>-12 |
| 6 | 10 | +36<br>0 | -25<br>-61 | +22<br>0 | -13<br>-28 | +15<br>0 | -5<br>-14 |
| 10 | 18 | +43<br>0 | -32<br>-75 | +27<br>0 | -16<br>-34 | +18<br>0 | -6<br>-17 |
| 18 | 30 | +52<br>0 | -40<br>-92 | +33<br>0 | -20<br>-41 | +21<br>0 | -7<br>-20 |
| 30 | 50 | +62<br>0 | -50<br>-112 | +39<br>0 | -25<br>-50 | +25<br>0 | -9<br>-25 |
| 50 | 80 | +74<br>0 | -60<br>-134 | +46<br>0 | -30<br>-60 | +30<br>0 | -10<br>-29 |

4. The elevation and incomplete plan view of a cut, square base, pyramid are shown in Fig. 4.

(i) Draw the given elevation and complete the plan of the pyramid in third angle projection.

(ii) Draw an end elevation when viewed in the direction of arrow A.

(iii) Draw a one piece surface development of the cut pyramid with the seam on a short edge.

(iv) Draw the true shape of the cut face.

(v) Measure and state the value of the fold angle between the surfaces B and C.

5. (a) In the mechanism shown in Fig. 5(a) the lever AB rocks between its limits about A. The link BD is pin-jointed at both ends and connects AB to another lever CD, which also rocks between its limits about C. A piston is connected to the mechanism by a rod EB, pin-jointed at B.

(i) Draw a line diagram showing the levers AB and CD at their maximum limits of travel. Measure and dimension on the drawing the angle through which the levers travel and the length of stroke of the piston.

(ii) On a separate drawing plot the locus of centre point P, for one complete oscillation of the mechanism.

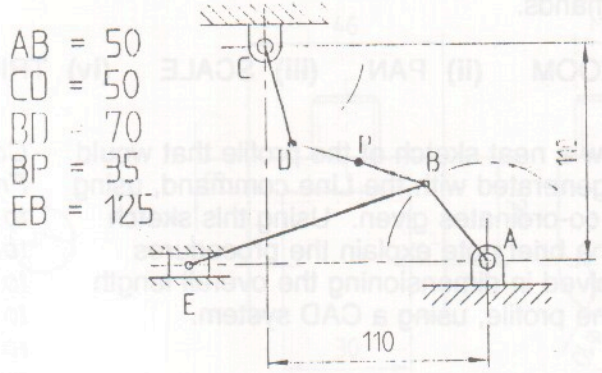



FIG. 5(a)

(b) The profile of a cam with a 16 mm diameter in-line follower is given in Fig. 5(b). Draw the given profile and the cam displacement diagram using a scale of 5 mm to represent 15° of cam rotation.

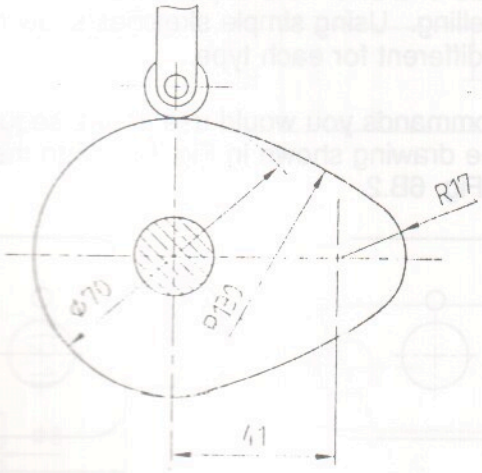



FIG. 5(b)

OVER →

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

## SECTION A

**(a)** Draw the profile of an acme screw thread showing two threads of pitch 40 mm, depth 20 mm and angle 29°. Title the drawing.

**(b)** Construct an involute curve for the quadrant of a 60 mm diameter base circle. Plot the curve for 15° intervals on the base circle.

**(c)** Draw three teeth of a rack with module 10 mm and pressure angle 20°. Dimension the pitch, tooth thickness, addendum and dedendum.

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

**OR**

## SECTION B

**(a)** Using a brief note explain the function of the following elements of a CAD system.

**(i)** Processor **(ii)** Hard Disk **(iii)** VDU **(iv)** Keyboard **(v)** Floppy Disk **(vi)** Mouse **(vii)** Plotter

List three types of Plotter suitable for plotting CAD drawings.

**(b)** With the aid of sketches and a brief note explain the purpose of the following CAD commands.

**(i)** ZOOM **(ii)** PAN **(iii)** SCALE **(iv)** TRIM

**(c)** Draw a neat sketch of the profile that would be generated with the Line command, using the co-ordinates given. Using this sketch and a brief note explain the procedures involved in dimensioning the overall length of the profile, using a CAD system.

| | | |
|---|---|---|
| *Command:* | LINE: | |
| *From point:* | X50 | Y50 |
| *to point:* | X100 | Y50 |
| *to point:* | X100 | Y70 |
| *to point:* | X130 | Y70 |
| *to point:* | X130 | Y50 |
| *to point:* | X180 | Y50 |
| *to point:* | X180 | Y80 |
| *to point:* | X160 | Y100 |
| *to point:* | X70 | Y100 |
| *to point:* | X50 | Y80 |
| *to point:* | X50 | Y50 |
| *to point:* | END | |

**(d)** With the aid of a brief note explain the difference between wire-frame, surface and solid modelling. Using simple sketches show how the representation of a cylinder would be different for each type.

**(e)** List the commands you would use, in the sequence that you would use them, to convert the drawing shown in Fig. 6B.1 into the finished drawing of the Plate shown in Fig. 6B.2

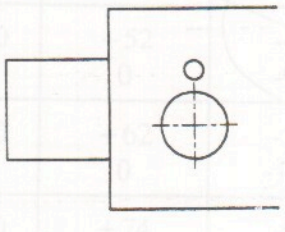


FIG. 6B.1

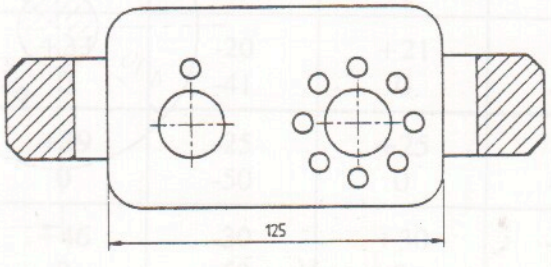
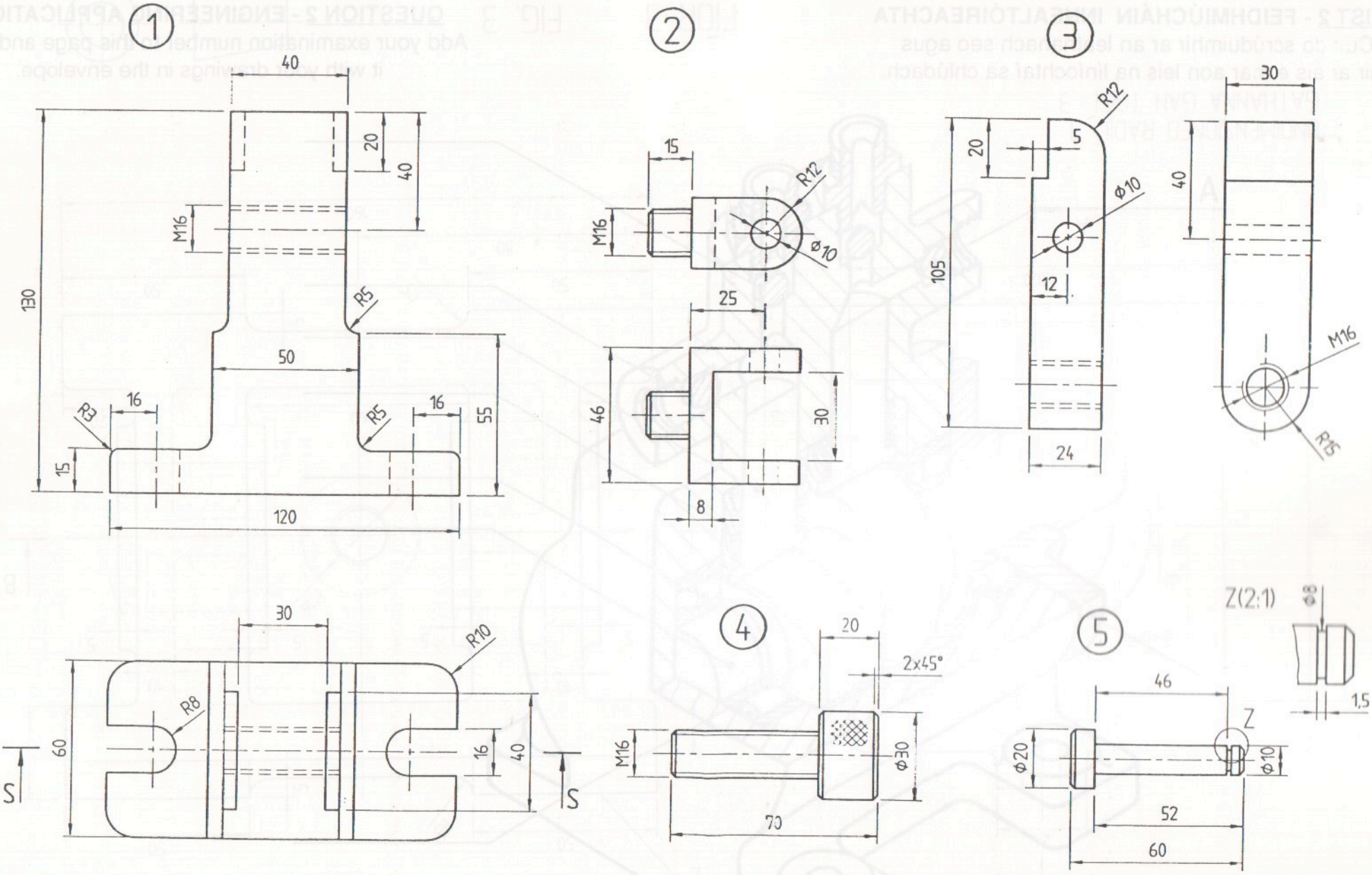



FIG. 6B.2


1
40
20
40
M16
130
R5
50
16
R3
R5
16
55
15
120
2
15
R12
M16
Ø10
25
46
30
8
3
30
R12
20
5
Ø10
105
12
24
40
M16
R15
30
R10
R8
60
16
40
S
S
4
20
2x45°
M16
Ø30
70
5
46
Z
Ø20
Ø10
52
60
Z(2:1)
Ø8
1,5

FIGUR 1 FIG. 1

SCRÚDÚ ARDTEISTIMEIREACHTA, 1996
CEIST 2 - FEIDHMIÚCHÁIN INNEALTÓIREACHTA
Cuir do scrúduimhir ar an leathanach seo agus cuir ar ais é mar aon leis na líníochtaí sa chlúdach.

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QUESTION 2 - ENGINEERING APPLICATIONS
Add your examination number to this page and return it with your drawings in the envelope.

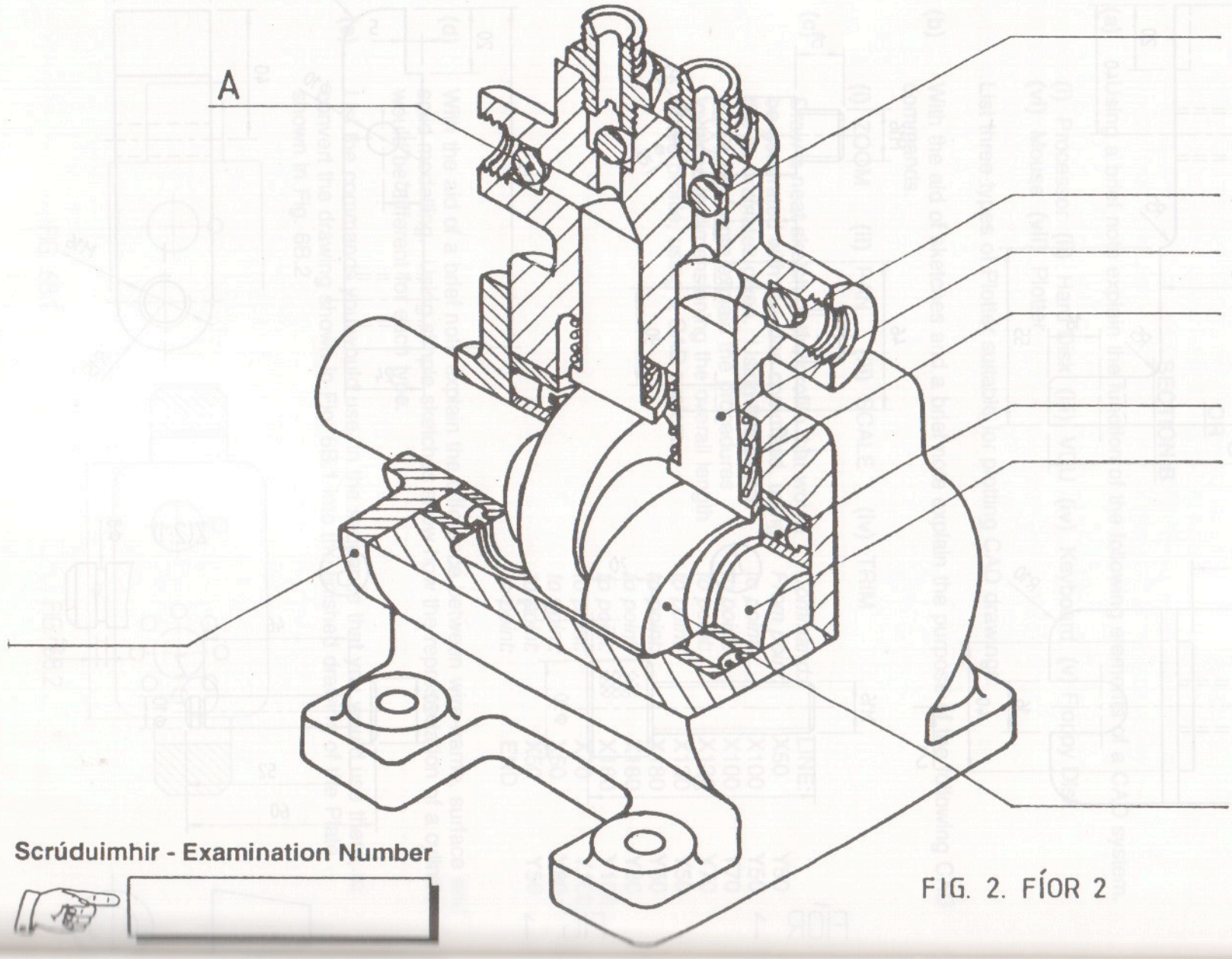
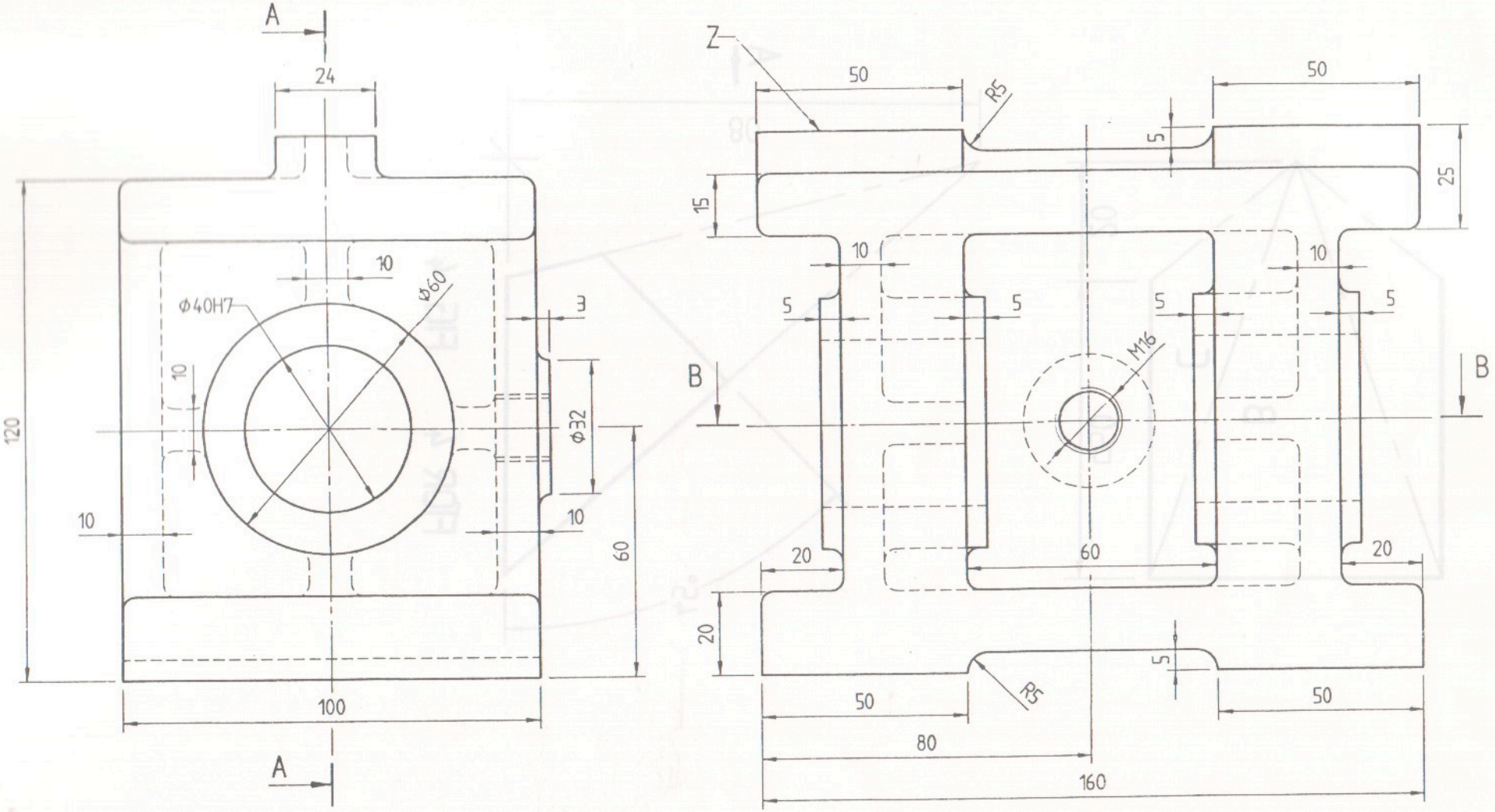



FIG. 2. FÍOR 2

**Scrúduimhir - Examination Number**




UNDIMENSIONED RADII 3
GATHANNA GAN TOISÍ 3

FÍOR 3 FIG. 3