



Coimisiún na Scrúduithe Stáit State Examinations Commission

LEAVING CERTIFICATE EXAMINATION, 2003

REQUIRED	NAME	PART
		3
		5
		6
		THRUST BEARING
		WOODRUFF KEY

TECHNICAL DRAWING - HIGHER LEVEL

PAPER II(A) - ENGINEERING APPLICATIONS

Friday 13 June, Afternoon 2.00 - 5.00 pm

200 Marks

INSTRUCTIONS

- Ensure that you have received examination paper M84(L) which accompanies this paper.
- Answer **any 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.

NOTE: All drawings are shown on examination paper M84(L) which accompanies this paper.

1. Details of a Crane Hook are given in Fig. 1 with a parts list tabulated below.

- (a) Draw a full size sectional elevation A-A showing the parts fully assembled. Show the thrust bearing in accordance with standard conventional representation.
- (b) Insert item reference numbers to identify the parts and add the title CRANE HOOK.
- (c) Make a neat freehand sketch of a special spanner that can be used to tighten the two-hole ring nut (part 5).

PART	NAME	REQUIRED
1	BODY	1
2	WHEEL	1
3	HOOK	1
4	BOLT	1
5	TWO-HOLE RING NUT	1
6	BUSH	1
7	THRUST BEARING	1

2. (a) Fig. 2(a) shows the details of a gas valve for an oven. The control knob can rotate clockwise through 180 degrees. The knob is attached to a plate cam, which raises a barrel in a sleeve by means of a 20 mm roller follower. The barrel has a circular hole through it. When the hole lines up with the gas pipe, gas can flow freely. The desired action of the valve is such that, when the control knob is turned through the first 90 degrees, the barrel is raised with uniform velocity until the maximum amount of gas is flowing. When the control knob is turned for the rest of its movement the barrel falls with uniform acceleration and retardation, i.e. rapidly at first and then slowing, until at the end sufficient gas is allowed through to give the desired simmering heat. Given the various heights for 'Off', 'Full on' and 'Simmer', which are measured from the cam centre to the roller follower centre, construct and draw the displacement diagram and cam profile which will give the desired movements and which incorporates positive limits to movement at each end of the 180 degree turn.
- (b) In the mechanism shown in Fig. 2(b) the crank AB rotates uniformly clockwise about fixed point A. The crank is connected to a link BC that carries a pin at D connecting it to link ED, which oscillates about the fixed point E. The end of link BC is connected to the piston F which is constrained to move horizontally.
- (i) Draw the mechanism, scale 1:1, and plot the locus of point C for one complete revolution of the crank AB;
 - (ii) Measure and dimension on the drawing the angle through which the link ED oscillates and the length of stroke of piston F.
 - (iii) Draw the profile of a simple machine guard about the mechanism with a minimum clearance of 15 mm.

3. The elevation and plan of a sheetmetal transition piece are shown in Fig. 3.
- (a) Draw the given views and produce a one-piece surface development of the transition piece with the seam at S-S.
 - (b) Make large sectional freehand sketches of the following:
 - (i) Pittsburgh lock seam joint;
 - (ii) Returned standing seam;
 - (iii) A method of stiffening thin sheetmetal panels.

4. A sectional view of a planetary gearbox is shown in Fig. 4. The gearbox is filled with oil to the level of the lowest gear tooth.

- (a) The following are identified with item references 1 to 12.

Ball bearing, Needle bearing, Oil seal, Gasket, External circlip, Internal circlip, Spring washer, Copper washer, Grub screw, Cheese head screw, Woodruff key, Feather key.

Draw a parts list, which shows the item number and name for each of these parts.

- (b) **Briefly** answer the following questions concerning the item references 13 to 18.

- (i) The gearbox housing (part 13) is to be produced as a casting. Suggest a material suitable for this purpose.
- (ii) The input shaft (part 14) rotates clockwise at 1800 rpm. State the direction of rotation and speed of the output shaft given that the gear ratio is 3:1.
- (iii) State the type of bearing shown (part 15).
- (iv) State the purpose of the plugs (parts 16 & 17).
- (v) Why is the small hole shown at 18 provided in the housing?

- (c) Make the following drawings, scale 1:1, of the spur gear, part 19. The gear has 20 teeth of involute form, module 8, 20° pressure angle, face width 75 mm, shaft diameter 70 mm, hub keyway width 20 mm, hub keyway depth 5 mm, gear fillets radius 3 mm.

- (i) A sectional elevation similar to that given;
- (ii) A front elevation, in the direction of arrow Y, showing **two** consecutive teeth.
- (iii) Tabulate on the sheet the following values for the gear, addendum, dedendum, pitch circle diameter, circular pitch, tooth thickness, and base circular diameter.

5. An elevation and end elevation of a machined block are given in Fig. 5 in third angle projection.
- Draw the following views of the block in first angle projection:
 - The given elevation;
 - An end elevation viewed in the direction of arrow E;
 - A plan viewed in the direction on arrow P.
 - Insert the following on the drawing:
 - Four leading dimensions;
 - The appropriate ISO projection symbol;
 - A symbol to indicate that the block is machined all over, surface texture N7;
 - Limits of size on the 10 mm H8 slot. Table of limits and fits is given below;
 - Title: MACHINED BLOCK.
 - Make a full size isometric drawing of the block. The drawing should be made on your drawing sheet and should have corner marked X as the lowest point. Hidden detail is not required.

NOMINAL SIZES		TOLERANCE		TOLERANCE	
OVER	TO	H8	e8	H8	f8
mm	mm	0.001 mm	0.001 mm	0.001 mm	0.001 mm
6	10	+22 +0	-25 -47	+22 +0	-15 -35
10	18	+27 +0	-32 -59	+27 +0	-16 -43

6. Answer SECTION A or SECTION B but not both

SECTION A

- A battery for a lorry is located on a steel channel section as shown in Fig. 6(a). With the aid of neat well-proportioned freehand sketches, pictorial or orthographic, suggest a suitable method of locating and attaching the battery to the channel. The battery must be securely held in place and be easily removed. Notes must be added to outline the key features of your solution.
- Make a neat freehand sectional sketch showing the construction of a piston assembly typical of the type used in any common internal combustion engine. Show clearly how the piston is attached to the connecting rod. Label and indicate on the sketch the Compression rings (2), Oil scraper ring, Connecting rod, Gudgeon pin bosses.
- Sketch freehand the following types of pin.
 - Taper pin;
 - Spring pin;
 - Split pin.

OR

SECTION B

- (a) **Briefly** answer the following questions. Sketches may be used where appropriate.
- (i) State **four** advantages that CAD offers over traditional drawing methods.
 - (ii) Which is the faster, a computer with a 1GHz processor and a 2 GB hard disk, or a 2GHz computer with a 1 GB hard disk? Which will store the more information?
 - (iii) Floppy disk, ZIP disk and CD-ROM are used for copying and backing-up drawings on a CAD system. State which system would be preferred for storing large amounts of data and give **two** reasons for your answer.
 - (iv) Explain the cause of aliasing, sometimes known as 'staircasing' on a VDU.
 - (v) Sketch an example of ordinate dimensioning.
 - (vi) Using circles sketch an example of a 3D rectangular array with 2 rows, 3 columns and 2 levels.
 - (vii) If the absolute co-ordinates (X, Y) of the start point of a line are 5, 3 and the end point is entered at @5, 3 what are the absolute co-ordinates of the end point of the line?
 - (viii) Name **one** Text Font available with CAD and demonstrate the effect of changing the text obliquing angle.
 - (ix) Show how 'write-protection' is accomplished with a floppy disk.
 - (x) Explain the purpose of a 'hyperlink' in an on-line CAD drawing.
- (b) 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:
- Help button, • Status bar, • Scroll box, • Pull-down menu bar,
 - Crosshair cursor, • Close button, • Plot button, • Co-ordinate display,
 - Command window, • Object properties toolbar.
- (c) Use simple sketches to show the meaning of the following 3D surfaces:
- (i) Revolved surface;
 - (ii) Extruded or Tabulated surface;
 - (iii) Ruled Surface.
- (d) Five useful features of a CAD system are:
- (i) MIRROR;
 - (ii) POLAR ARRAY;
 - (iii) GEOMETRIC TOLERANCE;
 - (iv) BREAK;
 - (v) SPLINE.

With the aid of sketches, show how **each** of the above named features could be used to create the drawing shown in Fig. 6(b) 1.

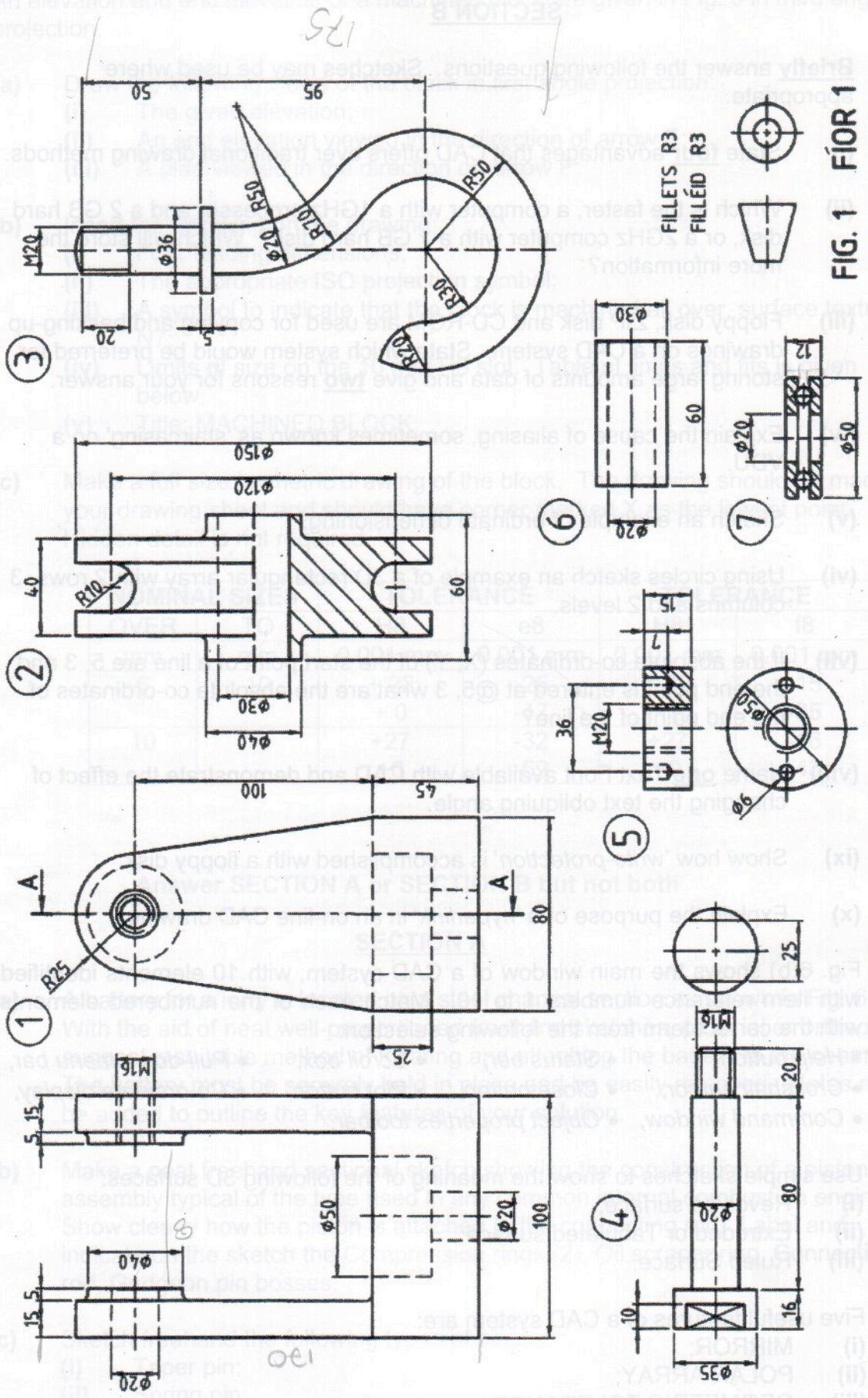


FIG. 1 FÍOR 1

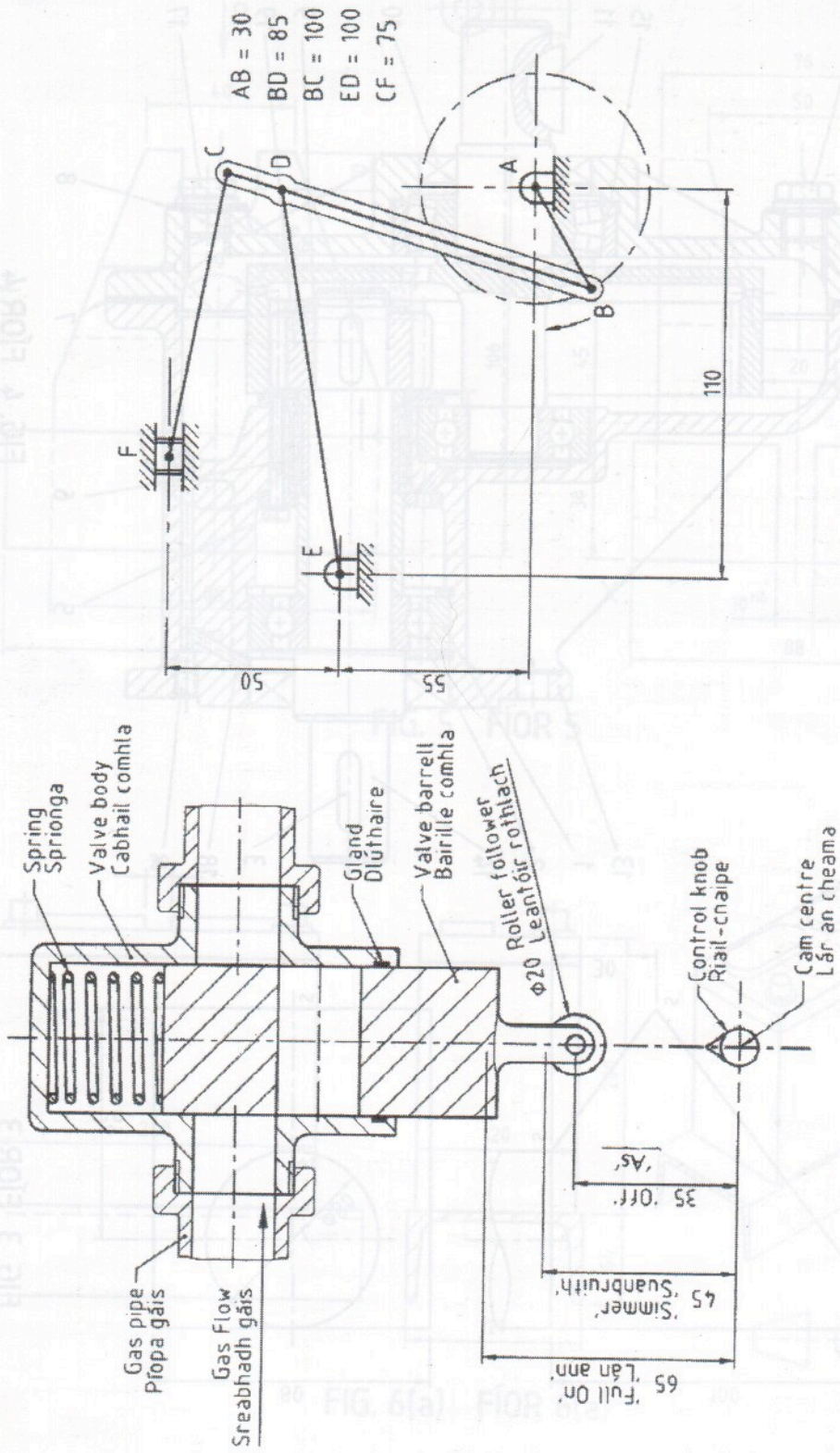


FIG. 2(b) FÍOR 2(b)

FIG. 2(a) FÍOR 2(a)

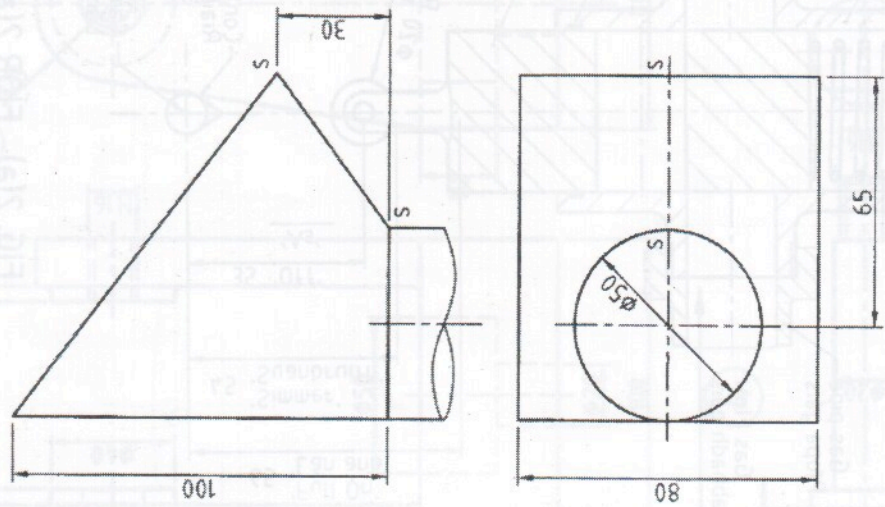


FIG. 3 FÍOR 3

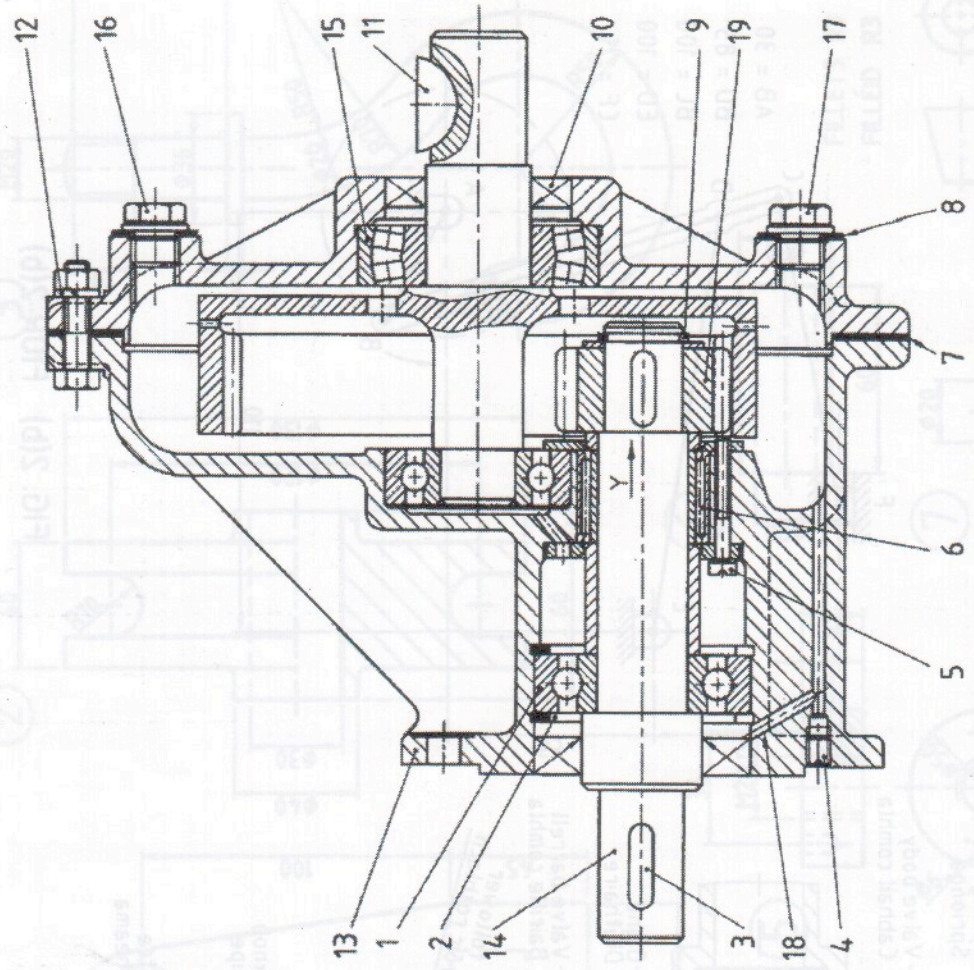


FIG. 4 FÍOR 4

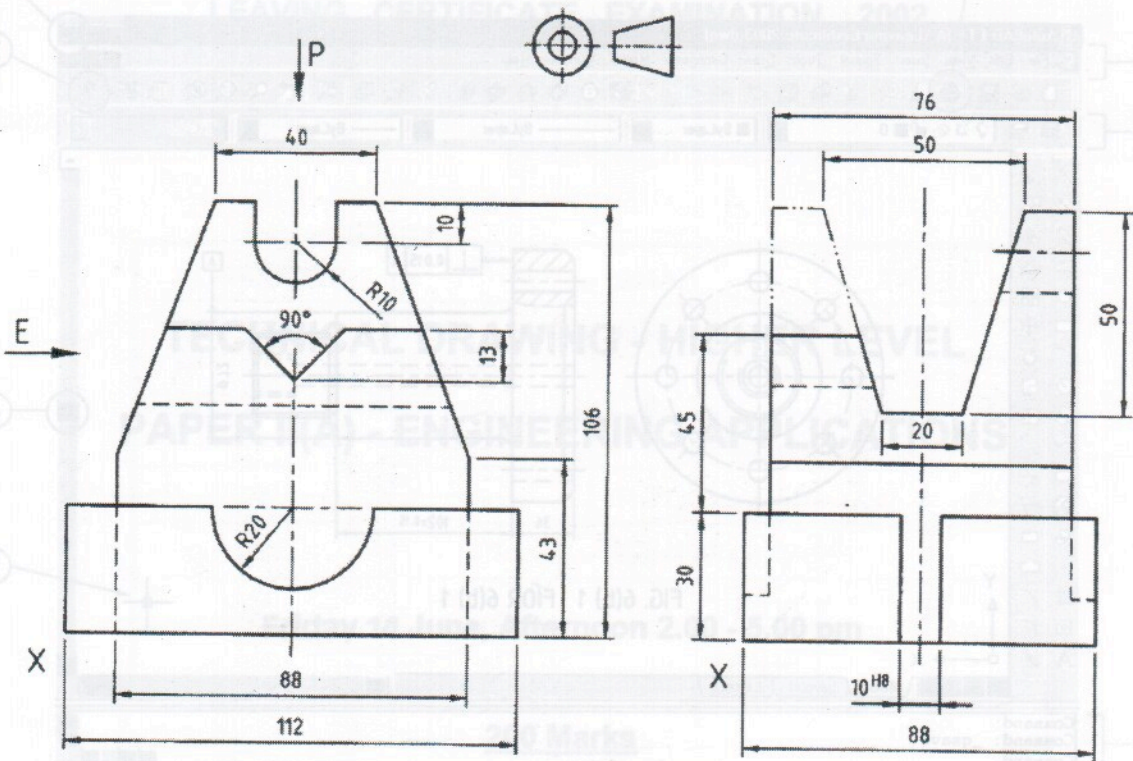


FIG. 5 FÍOR 5

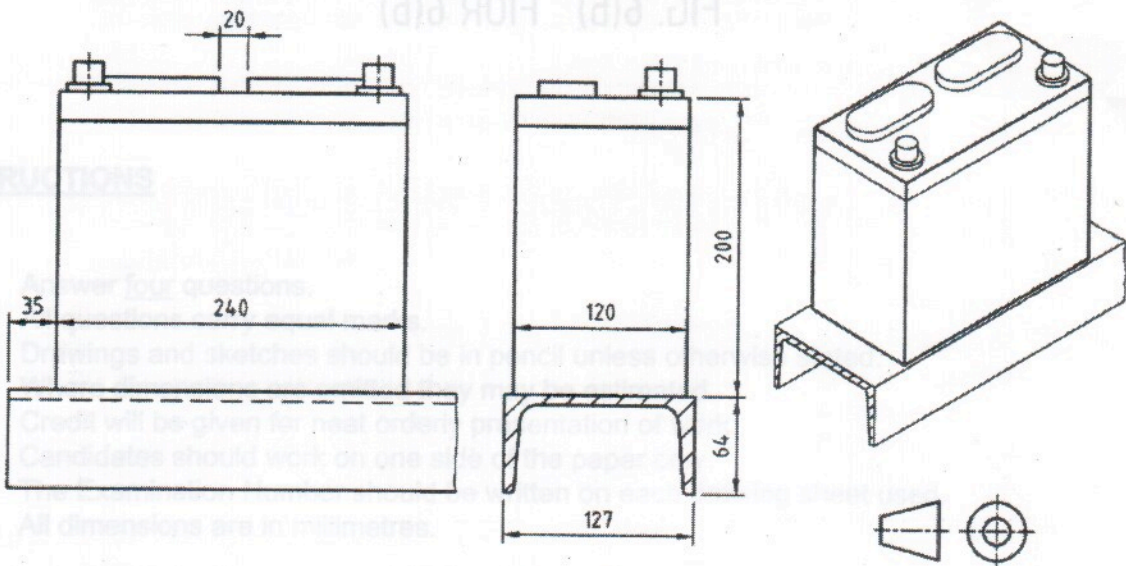


FIG. 6(a) FÍOR 6(a)

INSTRUCTIONS

Answer four questions.
 Drawings and sketches should be in pencil, unless otherwise stated.
 Credits will be given for neat work.
 Candidates should work on one side of the paper.
 All dimensions are in millimetres.

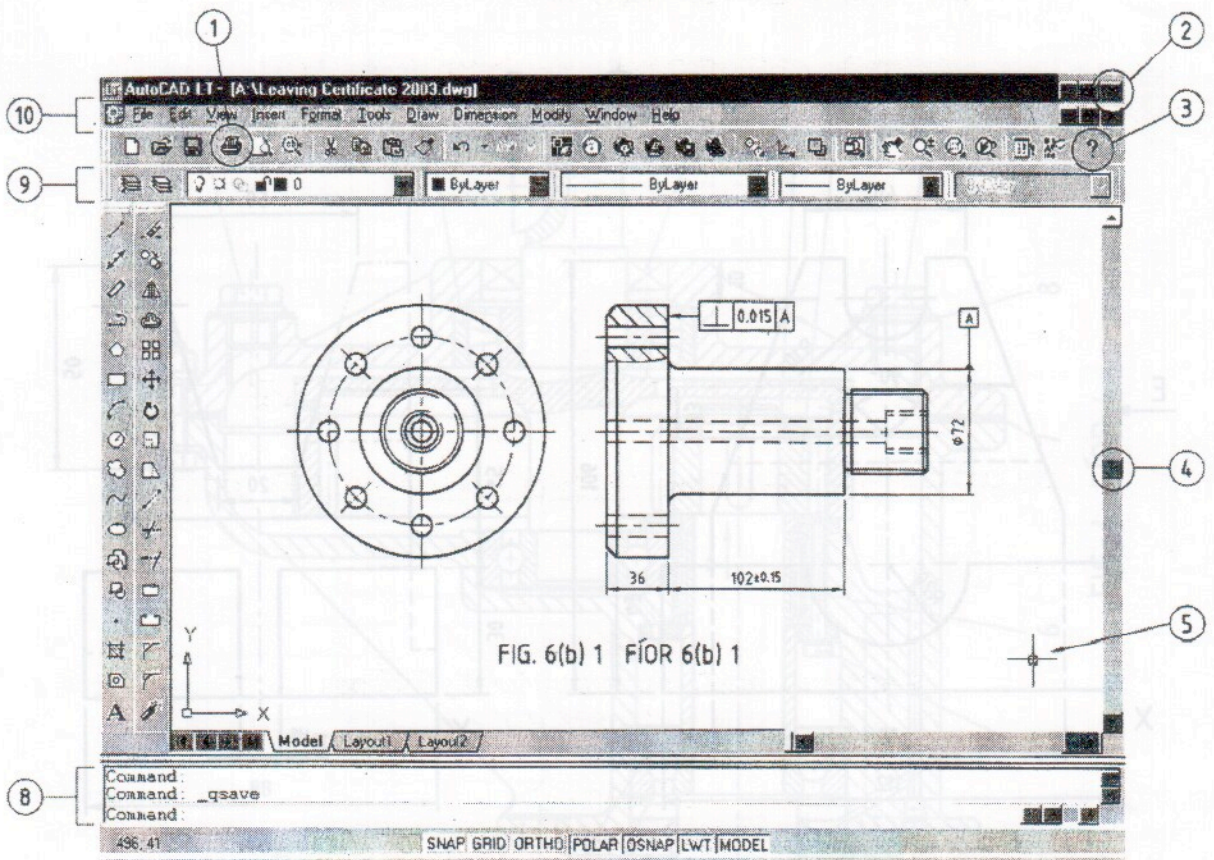


FIG. 6(b) FÍOR 6(b)

