LEAVING CERTIFICATE EXAMINATION, 1989

TECHNICAL DRAWING - HIGHER LEVEL

PAPER II(A) - ENGINEERING APPLICATIONS

THURSDAY, 22 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.

1. Details of a Drilling Fixture and Work Piece are shown in Fig. 1 with the parts list tabulated below.

INDEX	PART	REQUIRED
1	Handle	1
2	Body	1
3	Work Piece	1
4	Clamp	1
5	Pivot Bolt	1
6	Stud	1
7	M15 HEX NUT	1
8	15 DIA Washer	1
9	10 DIA x 20 Long Dowel	2

Parts 7, 8 and 9 are not shown in Fig. 1.

(a) Draw a sectional elevation of the assembled parts when viewed in the direction of arrows A - A with the work piece clamped in place.

Insert the following on the drawing:

(i) Title: DRILLING FIXTURE ASSY.
(ii) Four leading dimensions.

(b) Design separately, with the aid of a freehand sketch, a modification to the fixture to hold the clamp in place while the work piece is being released.

2. The elevation and half plan of a sheetmetal transition piece are shown in Fig. 2.

(a) (i) Draw the given views of the piece.

(ii) Draw a half development of the piece with the seam at CD. The top and bottom of the piece are open.

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

(b) Sketch freehand any three of the following:

(i) Wired edge.

(ii) Knock up seam.

(iii) Grooved seam.

(iv) Double grooved seam.

Title each of the sketches.

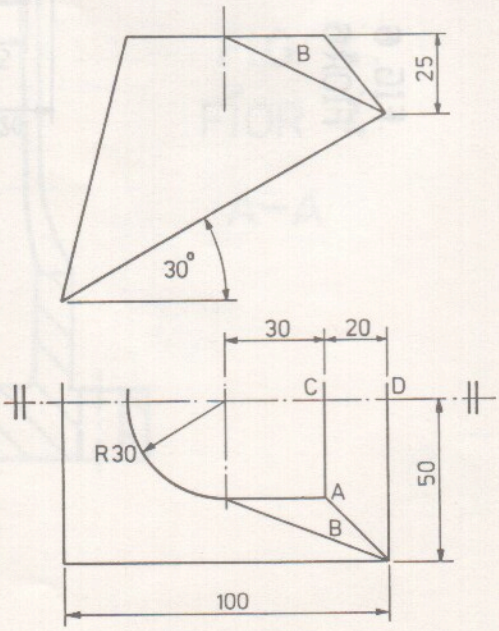


FIG. 2.

3. (a) Fig. 3 shows a schematic layout of a two stroke engine. Sketch freehand the layout drawing without the dimensions and identify and label on the sketch the following parts:- *Piston; Gudgeon Pin; Connecting Rod; Crank; Sump (Crankcase); Inlet, Exhaust and Transfer Ports.*

(b) Make outline freehand sketches of the individual parts indicated by the dimensions and engineering fits shown in Fig. 3.
Using the table of limits and fits supplied tolerance dimension the parts to suit the given fits.

4. (a) Draw the involute curve to a 35 mm radius semi-circle.

(b) The mechanism for a ram of an impact extrusion machine is shown in Fig. 4. The crank OA rotates at uniform angular velocity about O. The ram D is constrained to move along the line PQ while the guide B moves along MN.

(i) Draw the displacement diagram for the full movement of the ram D. Measure and state the stroke length of the ram.

(ii) Make a short comment on the ram displacement curve drawn.

5. (a) Fig. 5 shows the plate for a beam to stanchion flange connection.
Draw to scale a pictorial view of the connection in *isometric projection.* The plate is welded to the end of the beam and bolted to the stanchion flange.

BEAM: Depth 360, width 200, flanges 15 with 3° taper, web 8, fillet radius 8.

STANCHION: Depth 340, width 300, parallel flanges 30, web 20, fillet radius 10.

Add the following to the pictorial view:-

(i) The symbols for welding the plate to the beam.

(ii) The symbol for *site fitted high tensile friction grip bolts.*

(iii) Title: BEAM TO STANCHION FLANGE CONNECTION.

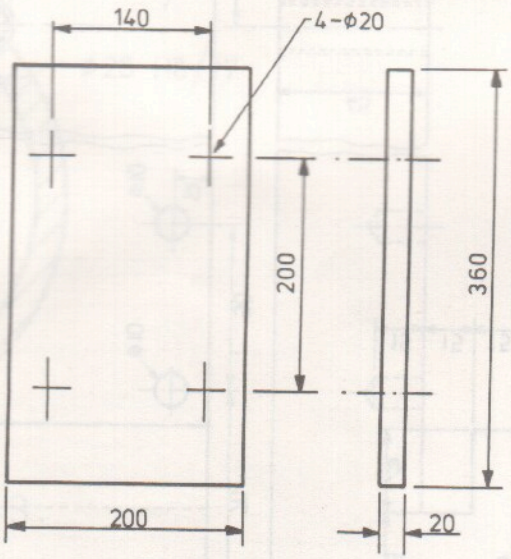


FIG. 5.

(b) Sketch freehand an *N* or *Box Type* lattice girder.

6. Details of a cam design are tabulated below:

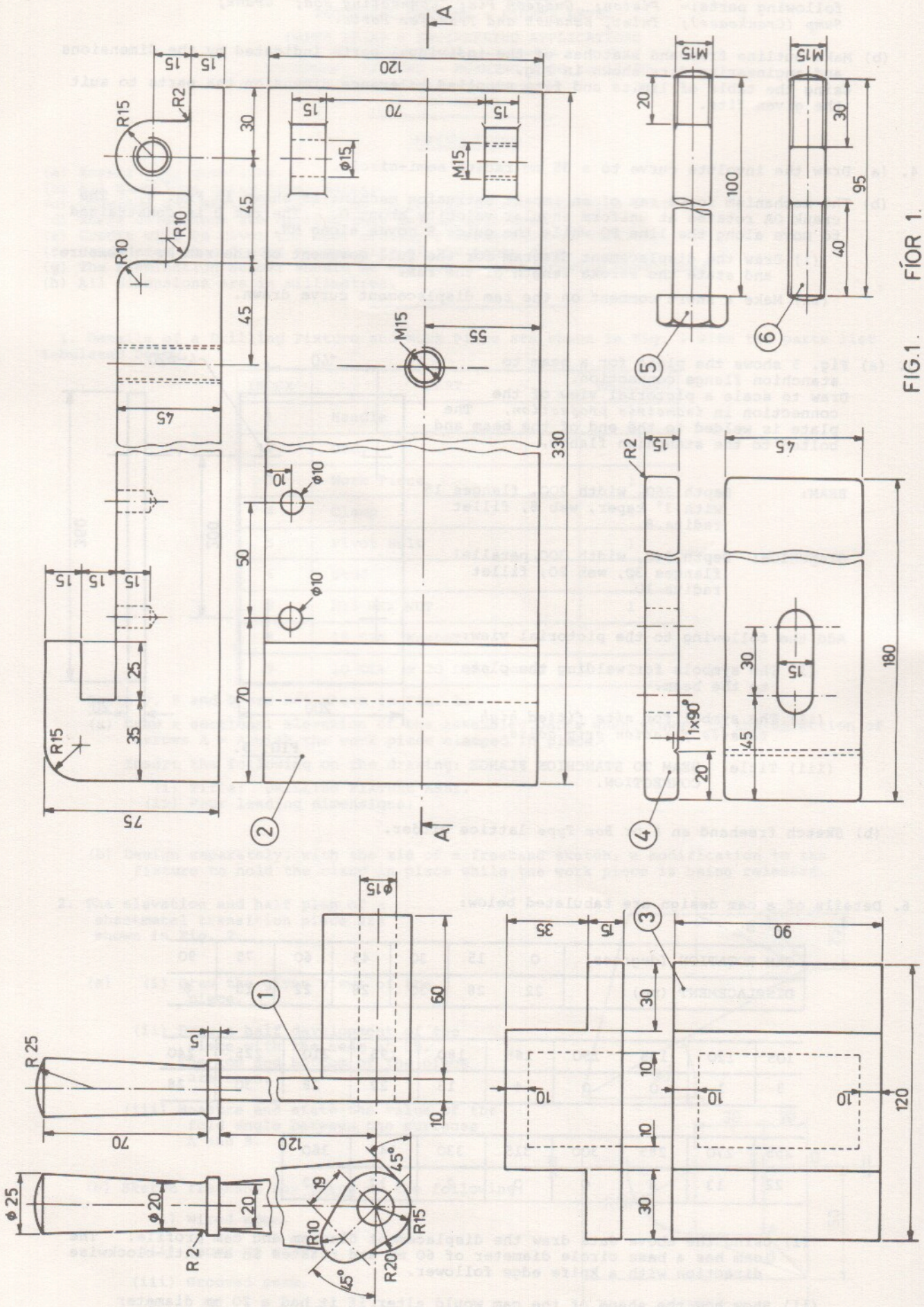
CAM ROTATION (degrees)	0	15	30	45	60	75	90
DISPLACEMENT (mm)	22	28	30	28	22	13	6

105	120	135	150	165	180	195	210	225	240
3	1	0	0	4	13	22	28	30	28

255	270	285	300	315	330	345	360
22	13	4	0	0	2	12	22

(i) Using the above data draw the displacement diagram and cam profile. The cam has a base circle diameter of 60 mm and rotates in an anti-clockwise direction with a knife edge follower.

(ii) Show how the shape of the cam would alter, if it had a 20 mm diameter roller follower, by drawing separately 0° to 60° of the cam profile.


A
15
15
120
R15
R2
30
15
70
15
ø15
M15
45
R10
R10
45
M15
55
45
330
ø10
10
50
ø10
70
15
15
15
25
35
R15
75
A
M15
20
100
M15
30
95
40
5
6
FIG.1. FÍOR 1.
R2
15
45
1x90°
20
30
15
45
180
4
ø15
60
10
1
R 25
5
70
120
ø 25
ø 20
20
19
45°
R10
R15
R 2
R20
45°
3
35
15
90
30
10
10
10
10
10
30
120

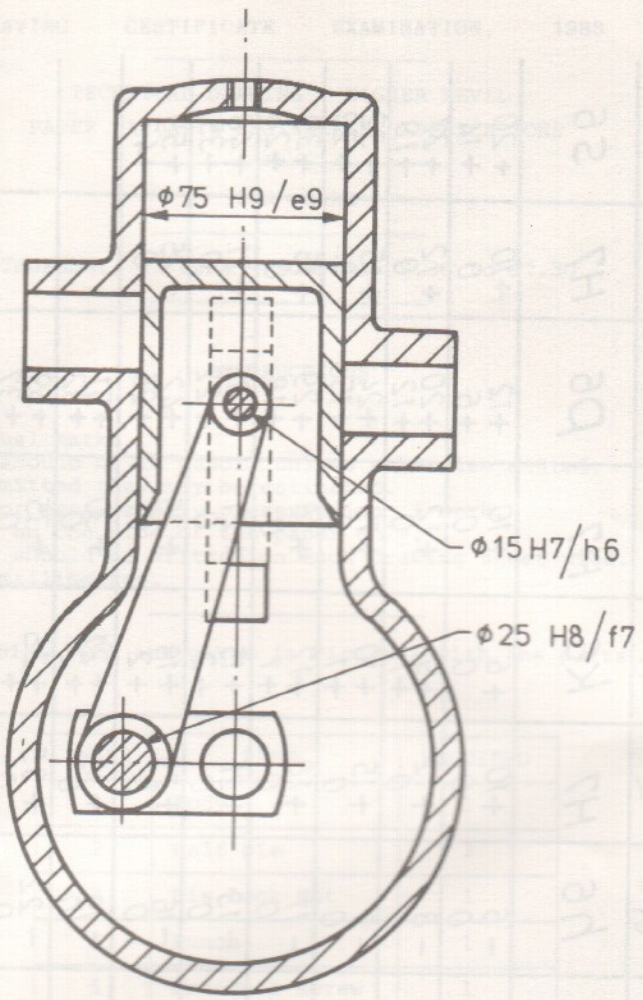
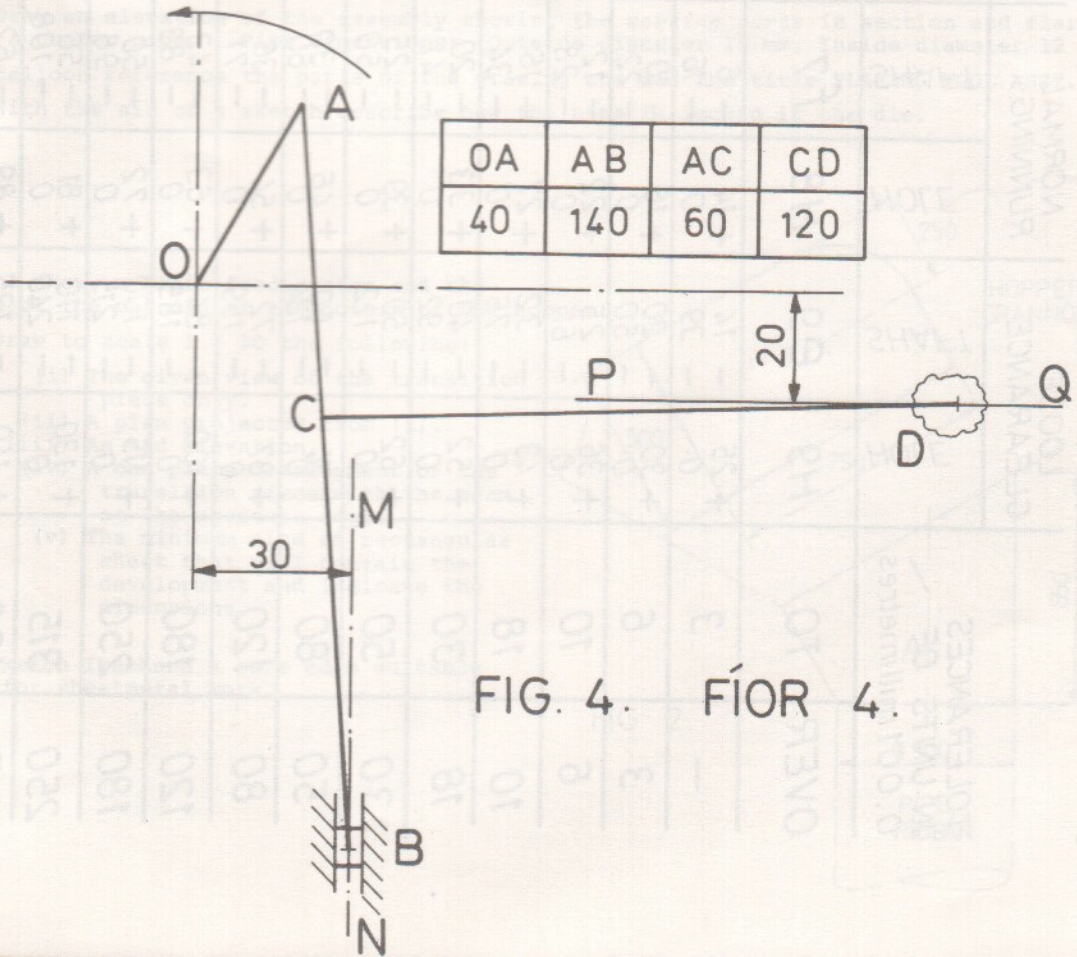


FIG. 3. FÍOR 3.



OA	AB	AC	CD
40	140	60	120

FIG. 4. FÍOR 4.

LIMITS AND FITS FOR ENGINEERING

TOLERANCES IN UNITS OF 0.001 millimetres		LOOSE CLEARANCE		NORMAL RUNNING		LOCATION		PUSH		PRESS (FERROUS PTS)		PRESS (NON FERROUS PTS)	
		HOLE	SHAFT	HOLE	SHAFT	HOLE	SHAFT	HOLE	SHAFT	HOLE	SHAFT	HOLE	SHAFT
OVER	TO	H9	e9	H8	f7	H7	h6	H7	k6	H7	p6	H7	s6
—	3	+25 0	−14 −39	+14 0	−6 −16	+10 0	−6 0	+10 0	+6 0	+10 0	+12 +6	+10 0	+20 +14
3	6	+30 0	−20 −50	+18 0	−10 −22	+12 0	−8 0	+12 0	+9 +1	+12 0	+20 +12	+12 0	+27 +19
6	10	+36 0	−25 −61	+22 0	−12 −28	+15 0	−9 0	+15 0	+10 +1	+15 0	+24 +15	+15 0	+32 +23
10	18	+43 0	−32 −75	+27 0	−16 −34	+18 0	−11 0	+18 0	+12 +1	+18 0	+29 +18	+18 0	+39 +28
18	30	+52 0	−40 −92	+33 0	−20 −41	+21 0	−13 0	+21 0	+15 +2	+21 0	+35 +22	+21 0	+48 +35
30	50	+62 0	−50 −112	+39 0	−25 −50	+25 0	−16 0	+25 0	+18 +2	+25 0	+42 +26	+25 0	+59 +43
50	80	+74 0	−60 −134	+46 0	−30 −60	+30 0	−19 0	+30 0	+21 +2	+30 0	+51 +32		
80	120	+87 0	−72 −159	+54 0	−36 −71	+35 0	−22 0	+35 0	+25 +3	+35 0	+59 +37		
120	180	+100 0	−84 −185	+63 0	−43 −83	+40 0	−25 0	+40 0	+28 +3	+40 0	+68 +43		
180	250	+115 0	−100 −215	+72 0	−50 −96	+46 0	−29 0	+46 0	+33 +4	+46 0	+29 +50		
250	315	+130 0	−110 −240	+81 0	−56 −108	+52 0	−32 0	+52 0	+36 +4	+52 0	+88 +56		
315	400	+140 0	−125 −265	+89 0	−62 −119	+57 0	−36 0	+57 0	+40 +4	+57 0	+98 +62		