AN ROINN OIDEACHAIS AGUS EOLAÍOCHTA

LEAVING CERTIFICATE EXAMINATION

2001

TECHNICAL DRAWING

HIGHER LEVEL

PAPER IIA

ENGINEERING APPLICATIONS

MARKING SCHEME

MARKING SCHEME: QUESTION 1

(a)	ASSEMBLY	4
(b)	SECTIONAL ELEVATION	30
(c)	ADDITIONAL REQUIREMENTS	10
(d)	DRAWING ANALYSIS	6
	TOTAL	50 Marks

ASSEMBLY	**(4)**
Valve seat in body	1
Valve in valve seat & closed	1
Gasket in position	1
Cover screwed into body	1

SECTIONAL ELEVATION	**(30)**
BODY	**10**
Bottom flange	1
Drilled holes	1
Diameter 60mm area	1
M52 threads	1
Wall thickness	1
Left flange	1
Diameter 50mm areas	1
Fillets	1
Outline	1
Correct areas hatched & neat	1
VALVE SEAT	**4**
Flange	1
Chamfer	1
Shank	1
Correct area hatched & neat	1
VALVE	**6**
Spigot/head	1
Chamfer	1
Vanes	1
Undercuts	1
Chamfers	1
Part unsectioned	1

GASKET	**3**
Diameter 80mm x 10mm	1
Diameter 54mm lines/clearance	1
Correct area hatched & neat	1
COVER	**8**
Hexagonal faces correct size	1
Appropriate chamfers & curves	1
Diameter 80mm x 10mm area	1
M52 mm threaded body	1
Thread convention lines	1
Chamfers	1
Spigot	1
Part not sectioned	1

ADDITIONAL REQUIREMENTS	**(10)**
Centre lines	2
Parts item referenced (Leaders; Terminations; Numbers)	3
Title supplied (F=1; G=2)	2
Overall presentation (F=1; G=2; Ex=3)	3
DRAWING ANALYSIS	**6**
Suitable metal suggested	2
Flow direction	2
Lift dimension	2

MARKING SCHEME: QUESTION 2

(a)	CAM & DISPLACEMENT DIAGRAM	30
(b)	MECHANISM	20
	TOTAL	50 Marks

CAM	**(30)**
DISPLACEMENT DIAGRAM	**13**
0^0 to 360^0 divisions	1
Appropriate divisions	1
Correct height	1
U.A.R construction	1
U.A.R additional points plotted	1
U.A.R curve drawn	1
U.A.R curve neat	1
Dwell	1
S.H.M construction	1
S.H.M curves drawn	1
S.H.M curve neat	1
Dwell	1
Overall presentation	1
CAM PROFILE	**17**
Centre lines drawn	1
Minimum circle	1
Maximum circle	1
Angular divisions 0^0 to90^0	1
U.A.R rads projected and swung	1
U.A.R cam curve drawn	1
U.A.R cam curve neat	1
Dwell 90^0 to150^0 correct	1
Angular divisions150^0 to330^0	1
S.H.M rads projected and swung	1
S.H.M curve drawn	1
S.H.M curve neat	1
Dwell 330^0 to360^0 correct	1
Dwell arcs neat	1
Rotation correct	1
Identification system	1
Overall presentation	1

MECHANISM	**(20)**
LAYOUT	**6**
Centre lines drawn	1
Circle and crank AB	1
Circle and crank CD	1
Link BE	1
Link DE	1
Link EF	1
LOCUS	**14**
Circles divided into 12 parts	1
Correct starting positions	1
Correct direction of rotation AB	1
Correct direction of rotation CD	1
Location of points E	3
Locus drawn and neat	1
Location of points F	1
Max & Min points obtained	1
Stroke F= 63.58mm ± 1mm	1
Dimension	1
Identification system	1
Presentation	1

MARKING SCHEME: QUESTION 3

(a)	ELEVATION	12
(b)	SECTIONAL SIDE ELEVATION A-A	12
(c)	SECTIONAL PLAN B-B	12
(d)	ADDITIONAL REQUIREMENTS	12
(e)	OVERALL PRESENTATION	2
	TOTAL	50 Marks

ELEVATION **(12)**

Diameter 90mm & 50mm circles	1
Radius 65mm semi-circle & lines	1
M24 hole	1
Thread convention correct	1
Top slot 16mm wide	1
Vertical slots top and bottom	1
RH slot	1
End & two inclined surfaces	1
Left top and bottom portions	1
Fillets	1
Centre lines	1
Cutting planes indicated	1

SECTION A-A **(12)**

Projected correctly	1
M24 hole drawn	1
Thread convention	1
Top slot drawn	1
Diameter 50mm c'bore	1
Diameter 90mm c'bore	1
Right slot	1
Edges behind cutting plane drawn	1
Correct area hatched & neat	2
Centre lines	1
Full shape description	1

SECTION B-B **(12)**

Projected correctly	1
M24 hole	1
Thread convention	1
Diameter 50mm c'bore hole	1
Diameter 90mm c'bore hole	1
Centre slot	1
Right slot	1
Edges behind cutting plane drawn	1
Correct area hatched & neat	2
Centre lines	1
Full shape description	1

ADDITIONAL REQUIREMENTS (12)

- Four dimensions (½ mark each) 2
- Appropriate projection symbol 2
  (Provided 1)
  (Correct 1)
- Title: Control Bracket 2
  (G=1; Ex=2)
- Machining Symbol 3
  (Symbol 1)
  (Grind 1)
  (N5 1)
- LIMITS 3
  (Upper correct 1)
  (Lower correct 1)
  (Positioning 1)

PRESENTATION **(2)**

Overall presentation 2
(G=1; Ex=2)

MARKING SCHEME: QUESTION 4

(a)	GIVEN VIEWS	6
(b)	TRUE LENGTHS	12
(c)	DEVELOPMENT	22
(d)	SHEETMETAL JOINTS	10
	TOTAL	50 Marks

GIVEN VIEWS	**(6)**
PLAN	**3**
Circle correct size	1
Rectangle correct size	1
Outline & centrelines	1
ELEVATION	**3**
Base	1
Top	1
Side, inclined side & centre line	1

TRUE LENGTHS	**(12)**
Parallel lines on cylinder	1
Surface divided into triangles	2
Layout of true lenghts	2
4 true lengths	6
Identification system	1

DEVELOPMENT	**(22)**
One piece development	2
Transition piece area correct (9 triangles x 1mark)	9
Cylinder area correct (6 rectangles x 1 mark)	6
Seam on SS	1
Identification system	1
Outline of development neat	2
Curve neatly drawn	1

SHEETMETAL JOINTS	**(10)**
DOUBLE GROOVED SEAM	**3**
Correct joint provided	1
Sketch detail correct	1
Sketch presentation/neatness	1
RIVETED LAPPED SEAM	**4**
Correct joint provided	1
Sketch detail correct	1
Rivet named	1
Sketch presentation/neatness	1
DOUBLE HEMMED EDGE	**3**
Correct edge provided	1
Sketch detail correct	1
Sketch presentation/neatness	1

MARKING SCHEME: QUESTION 5

(a)	PARTS LIST	15
(b)	SPUR GEAR DRAWING	25
(c)	BEVEL GEAR	10
	TOTAL	50 Marks

PARTS LIST	**(15)**
Parts list table drawn	1
12 parts identified (1mark each)	12
Lettering neat	1
Presentation	1

SPUR GEAR DRAWING	**(25)**
SPUR GEAR ELEVATION	**7**
Centre lines	1
PCD	1
Addendum circle	1
Bore	1
Keyway	1
Correct gear convention	1
Presentation	1
SPUR GEAR SECTION	**8**
Face width	1
Tip diameter	1
PCD centre lines	1
Root diameter	1
Hub	1
Keyway	1
Correct area hatched & neat	1
Presentation	1
TABLE OF GEAR DATA	**10**
Gear calculations	4
Table drawn	1
Required list supplied	1
Data (6 off x ½ mark each)	3
Lettering neat	1

BEVEL GEAR	**(10)**
Centre lines at 90^0	1
Pinion PCD drawn	1
Wheel PCD calculation	1
Wheel PCD drawn	1
Pinion &wheel pitch cones drawn	1
Dimension pinion PCD	1
Dimension pinion pitch cone angle	1
Dimension wheel PCD	1
Dimension wheel pitch cone angle	1
Presentation	1

MARKING SCHEME: QUESTION 6A

(a)	ISOMETRIC DRAWING	30
(b)	FOUR STROKE COMPRESSION ENGINE	20
	Total	50 Marks

ISOMETRIC DRAWING **(30)**

COMPONENT FEATURES	**(20)**
Cylinder	**4**
Diameter 38mm isometric circle	1
Diameter 56mm isometric circle	1
Diameter 56mm isometric arc rear	1
Tangents	1
Boss	**5**
Centres correctly located	1
Diameter 14mm isometric circle	1
Diameter 26mm isometric circle	1
Diameter 26mm isometric arc	1
Tangents	1
Fork	**7**
Centres correctly located	1
Diameter 10mm isometric circle	1
Radius 13mm isometric circle	1
Fork front area complete	1
Front fork thickness	1
Rear fork drawn	1
Fork base	1
Web	**4**
Top surface	1
Left area at fork end	1
Diameter 56mm isometric arc	1
Bottom of web at boss end	1
VIEW DETAILS	**10**
Drawn in isometric projection	1
Correct viewpoint	2
Construction for circles and curves	4
Presentation	3
(F=1; G=2; Ex=3)	

FOUR STROKE ENGINE	**(20)**
INTAKE STROKE	**5**
Intake & exhaust valves drawn	1
Piston & connecting rod drawn	1
Engine details (head, walls etc)	1
Sketch details correct & neat	1
Operation correctly explained	1
COMPRESSION STROKE	**5**
Intake & exhaust valves drawn	1
Piston & connecting rod drawn	1
Engine details (head, walls etc)	1
Sketch details correct & neat	1
Operation correctly explained	1
POWER STROKE	**5**
Intake & exhaust valves drawn	1
Piston & connecting rod drawn	1
Engine details (head, walls etc)	1
Sketch detail correct & neat	1
Operation correctly explained	1
EXHAUST STROKE	**5**
Intake & exhaust valves drawn	1
Piston & connecting rod drawn	1
Engine details (head, walls etc)	1
Sketch detail correct & neat	1
Operation correctly explained	1

MARKING SCHEME: QUESTION 6B

(a)	CAD WINDOW / INTERFACE	10
(b)	CAD PROFILE	10
(c)	CAD HARDWARE	10
(d)	SOLID MODELLING OPERATIONS	10
(e)	COMMANDS	10
	Total	50 Marks

CAD WINDOW / INTERFACE	**(10)**
1 mark for each correct answer	10

CAD PROFILE	**(10)**
VDU/ Sheet border drawn	1
3 lines drawn and correct	3
Lines mirrored	1
3 point arc drawn and correct	1
Circle drawn and correct	1
Text correctly centered	1
Accurate full shape description	1
Linework & presentation	1

CAD HARDWARE	**(10)**
• RAM	1
Hard disk	1
VDU	1
Processor speed	1
• Scanner	2
• Modem	1
Modem speed	1
Overall neatness of lettering	1

SOLID MODELLING	**(10)**
Union operation	3
Subtraction operation	3
Intersection operation	3
Neatness of lettering & sketches	1

COMMANDS	**(10)**
1 mark per appropriate command	8
Correct sequence	2

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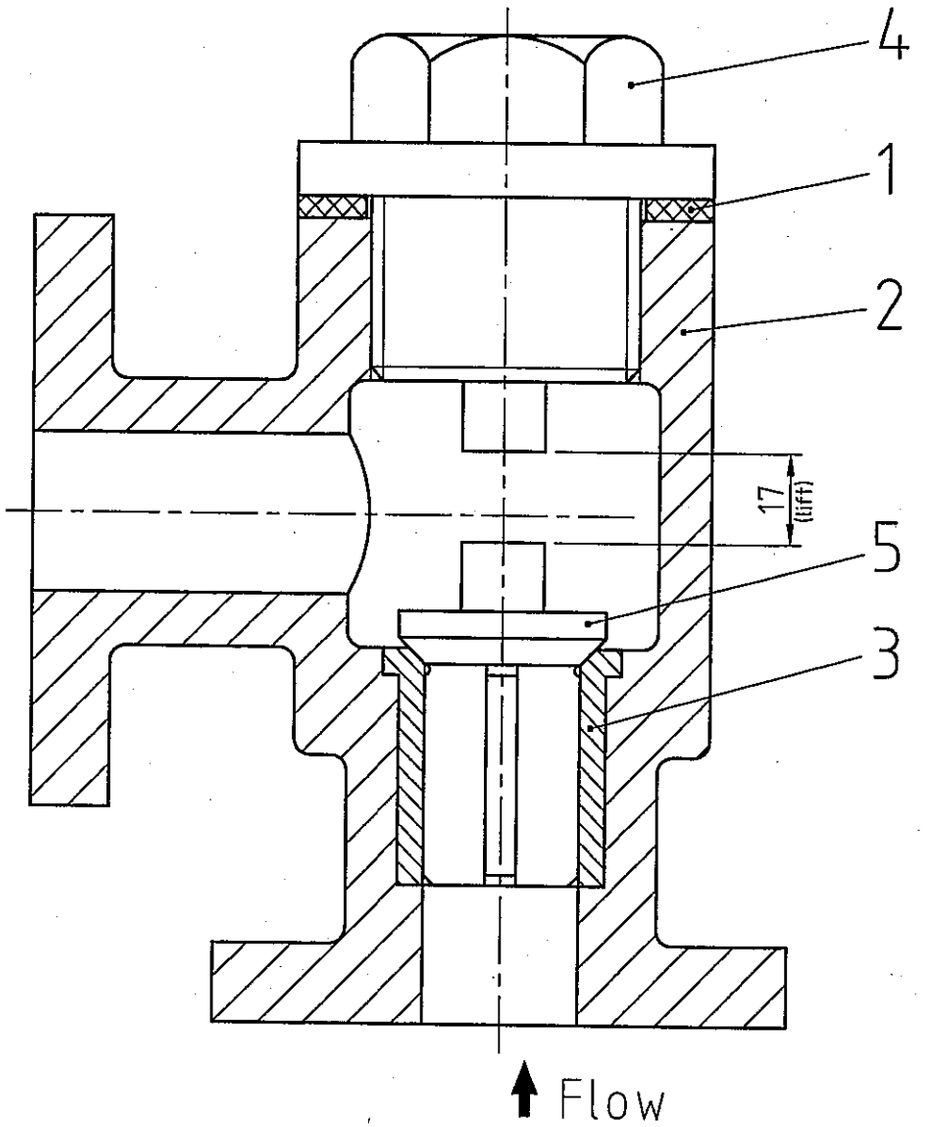
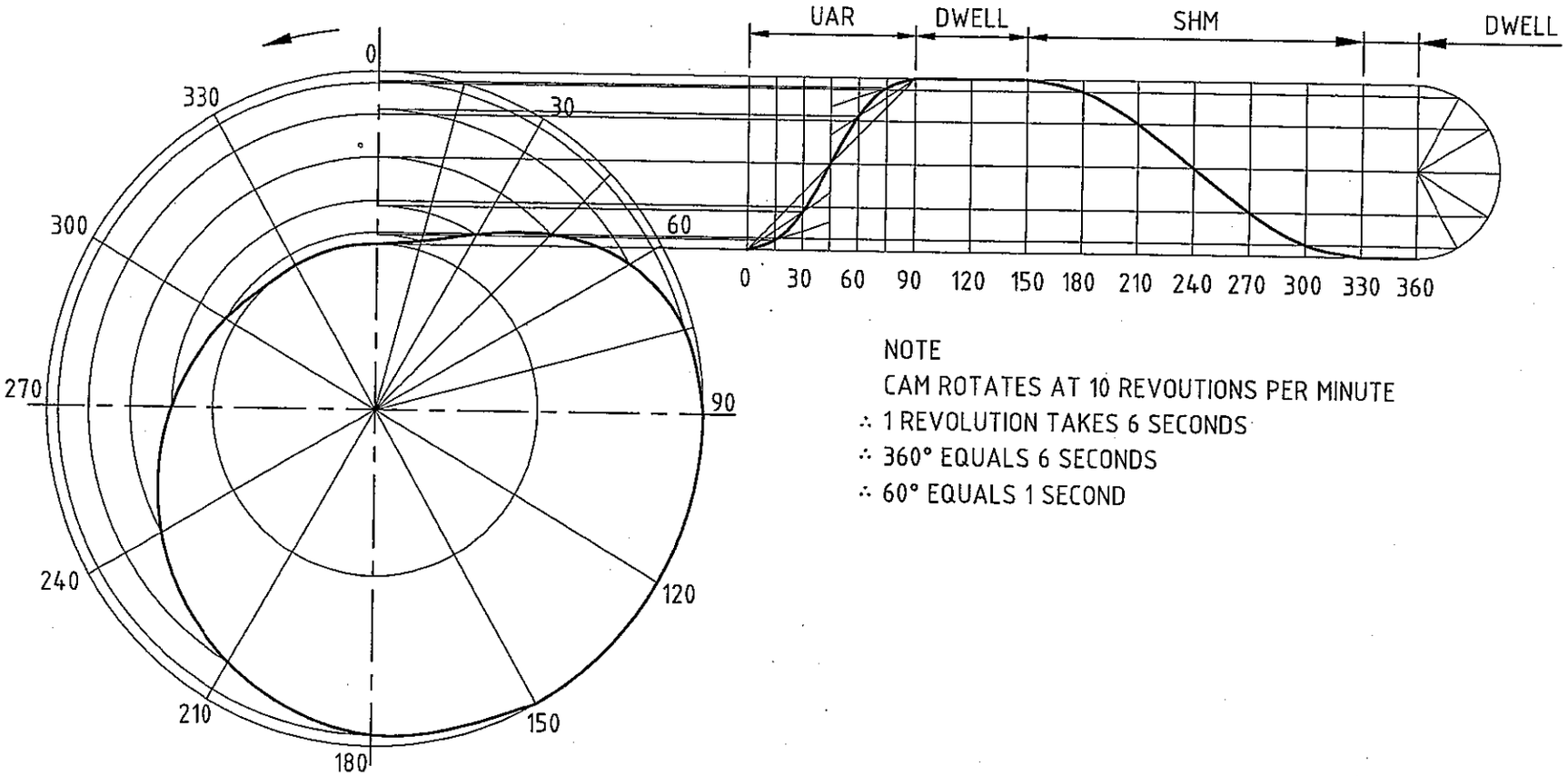
ENGINEERING APPLICATIONS

MODEL ANSWERS



NON RETURN VALVE

Material: Cast Iron



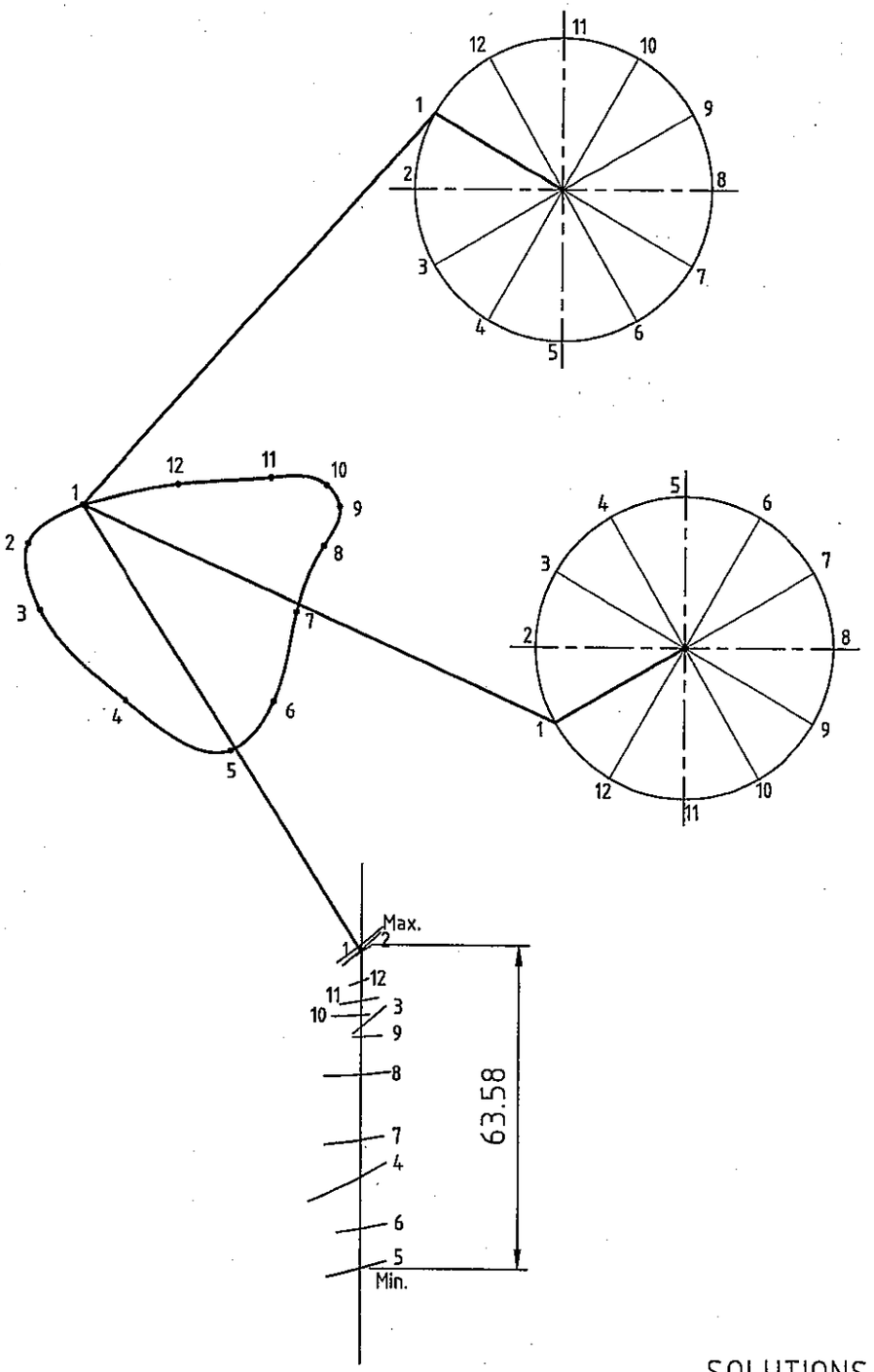
NOTE

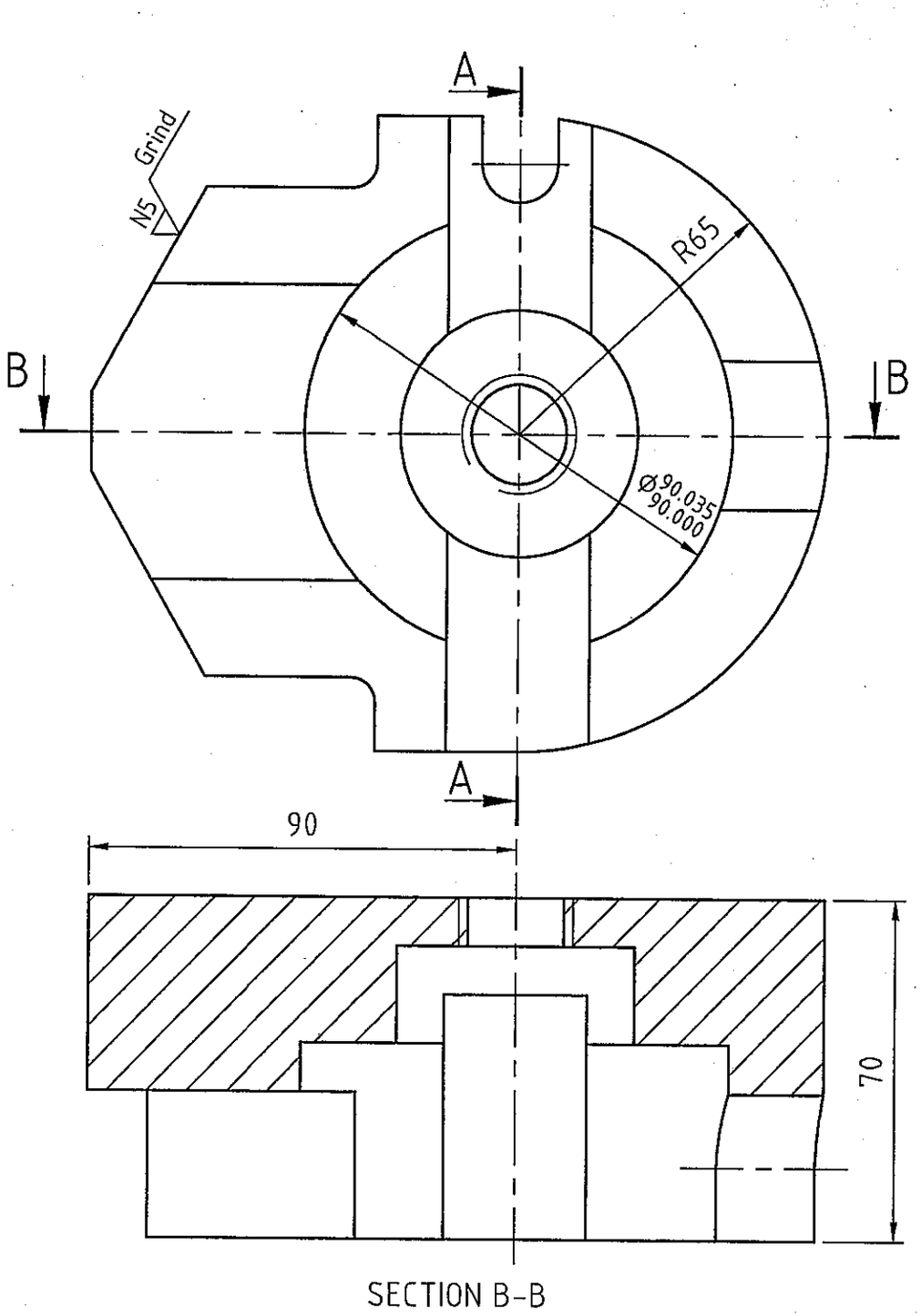
CAM ROTATES AT 10 REVOUTIONS PER MINUTE

∴ 1 REVOLUTION TAKES 6 SECONDS

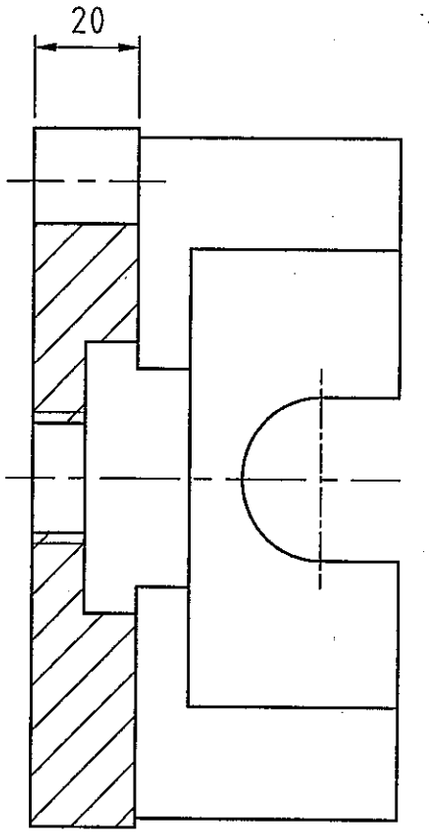
∴ 360° EQUALS 6 SECONDS

∴ 60° EQUALS 1 SECOND

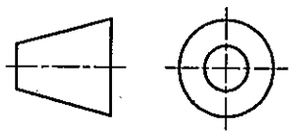

12
11
10
1
9
2
8
3
7
4
6
5
Max.
Min.
63.58



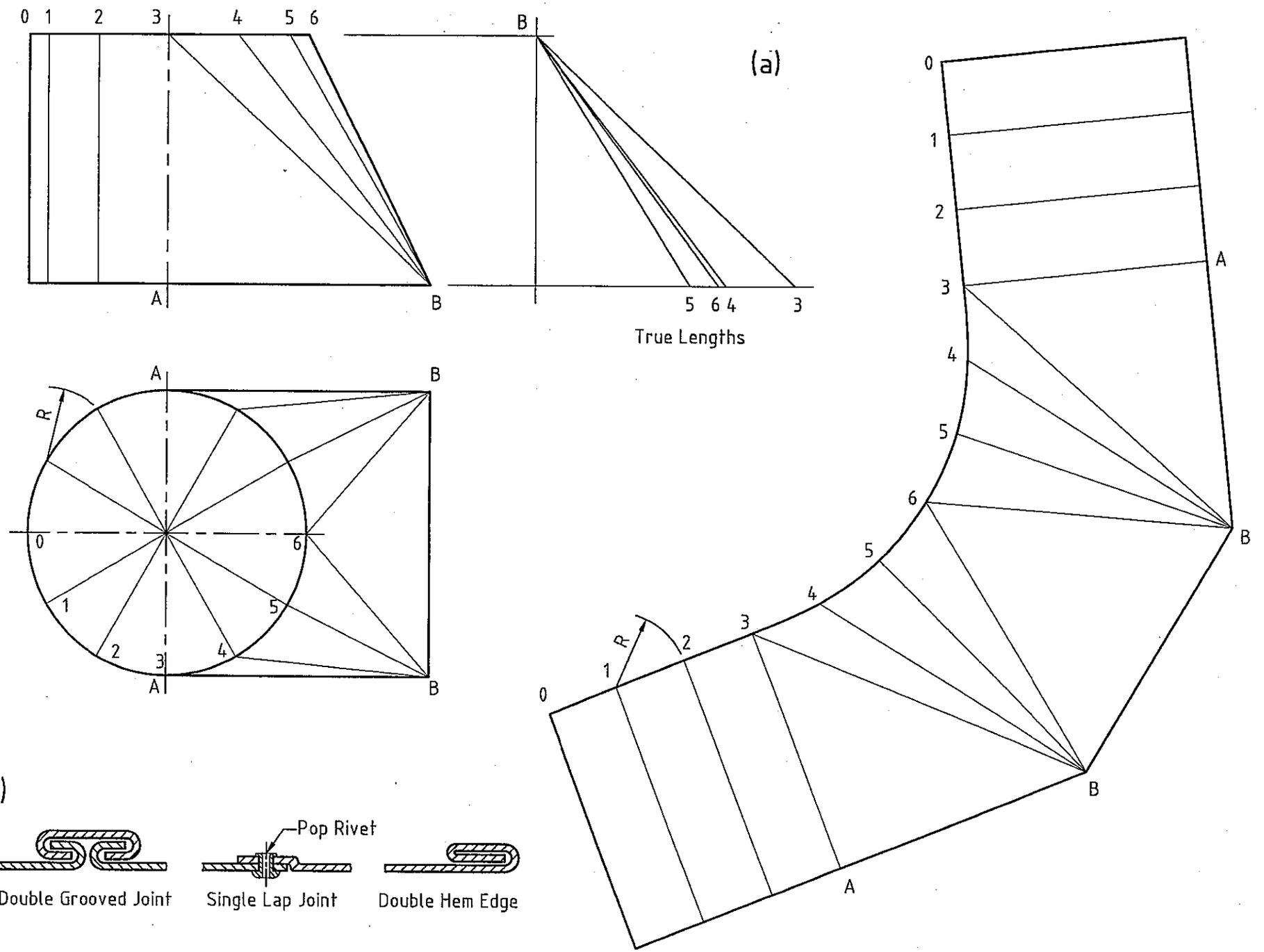
SECTION B-B



SECTION A-A



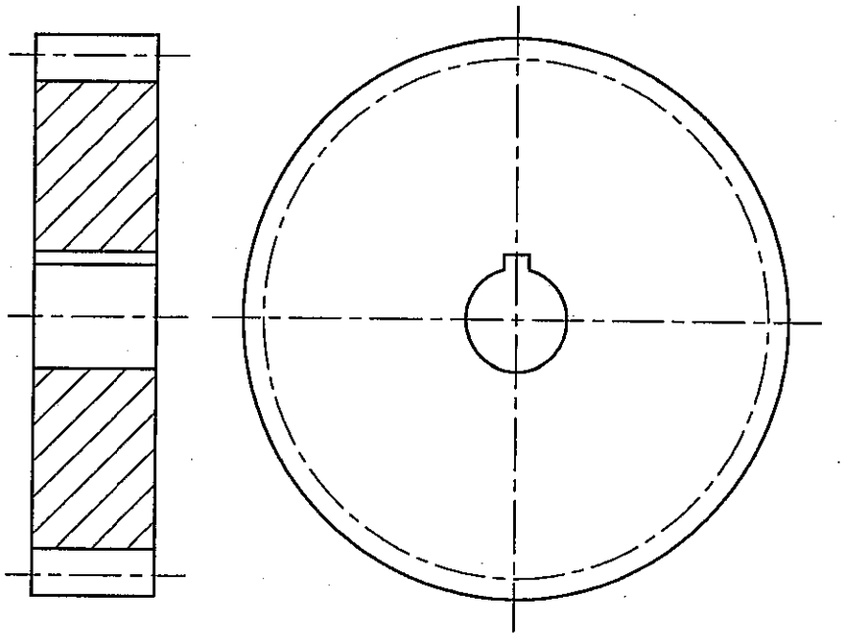
CONTROL BRACKET


(a)
0 1 2 3 4 5 6
A
B
B
5 6 4 3
True Lengths
A
B
R
0
6
1
5
2
3
4
A
B
0
1
2
3
4
5
6
A
B
R
A
B
(b)
Pop Rivet
Double Grooved Joint
Single Lap Joint
Double Hem Edge

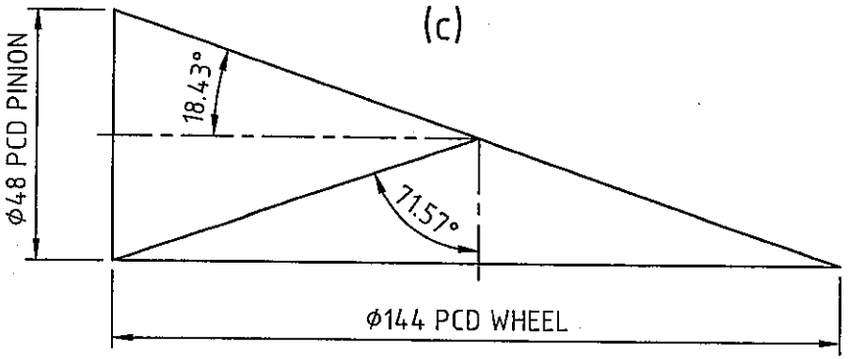
(a)

ITEM	ITEM NAME
12	EXTERNAL CIRCLIP
11	SOCKET HEAD CAP SCREW
10	THRUST BALL BEARING
9	HEX HEAD SET SCREW
8	DOUBLE ROW SELF ALIGNING BEARING
7	BEVEL GEAR WHEEL
6	INTERNAL CIRCLIP
5	SPLINED SHAFT
4	GRUB SCREW
3	BALL BEARING
2	DOUBLE ROW ANGULAR CONTACT BALL BEARING
1	OIL SEAL

(b)

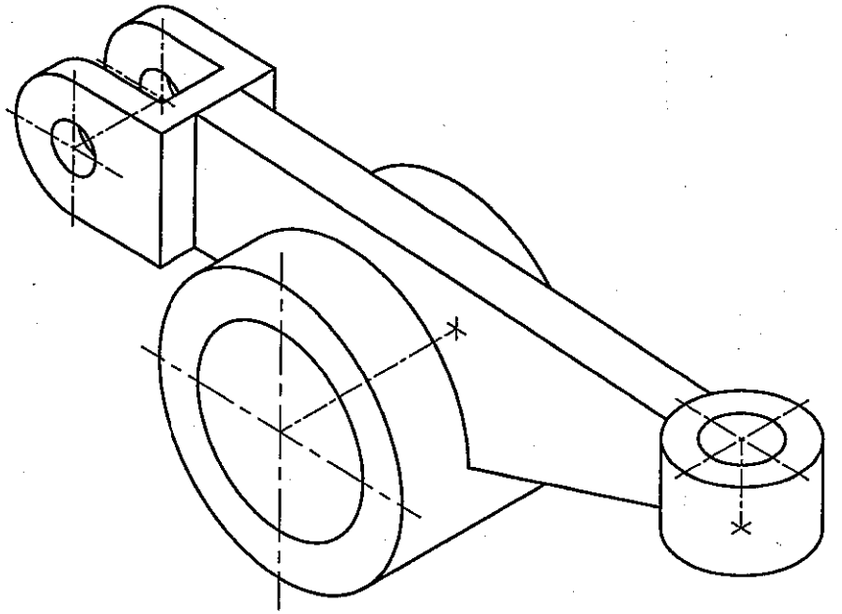


(c)

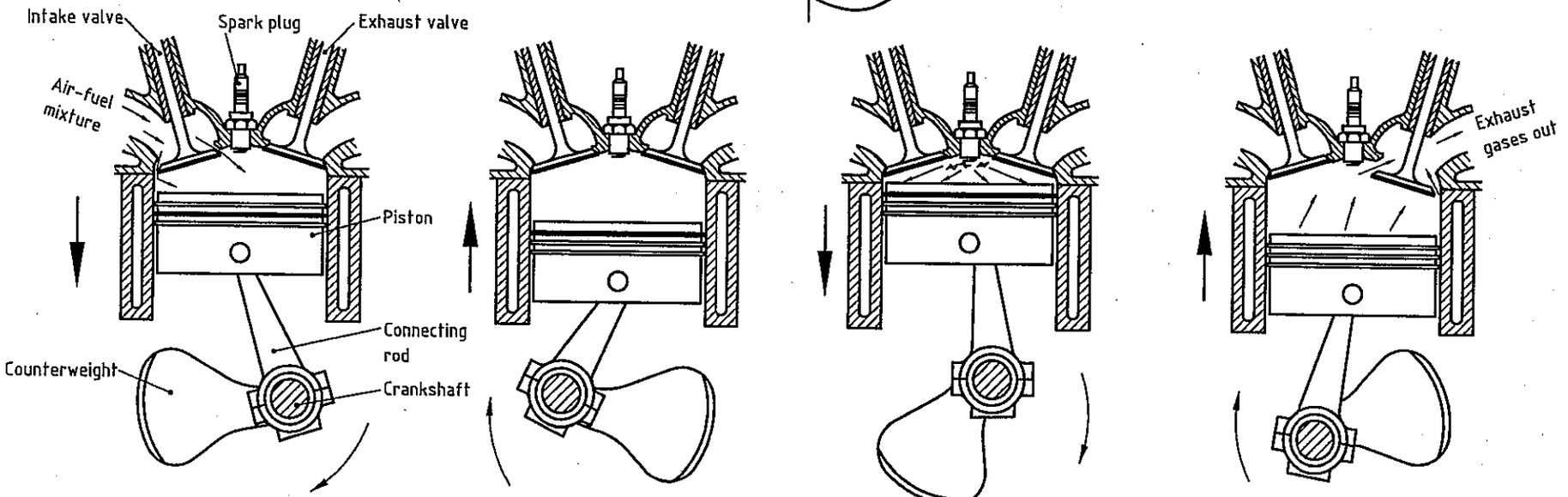


SPUR GEAR TABLE	
ADDENDUM	4
DEDENDUM	5
PCD	100
CIRCULAR PITCH	12.566
TOOTH THICKNESS	6.283
BASE CIRCLE DIAMETER	93.969

(a)



(b) FOUR STROKE SEQUENCE



1. INTAKE STROKE

The intake valve (at left) has opened. The piston is moving downwards, allowing the air-fuel mixture to enter the cylinder.

2. COMPRESSION STROKE

The intake valve has closed. The piston is moving upwards, compressing the air-fuel mixture.

3. POWER STROKE

The ignition system has delivered a spark to the spark plug that ignites the compressed mixture. As the mixture burns, it creates a high pressure that pushes the piston down and turns the crankshaft.

4. EXHAUST STROKE

The exhaust valve (at right) has opened. The piston moves upwards as the burned gases escape from the cylinder.

(a)

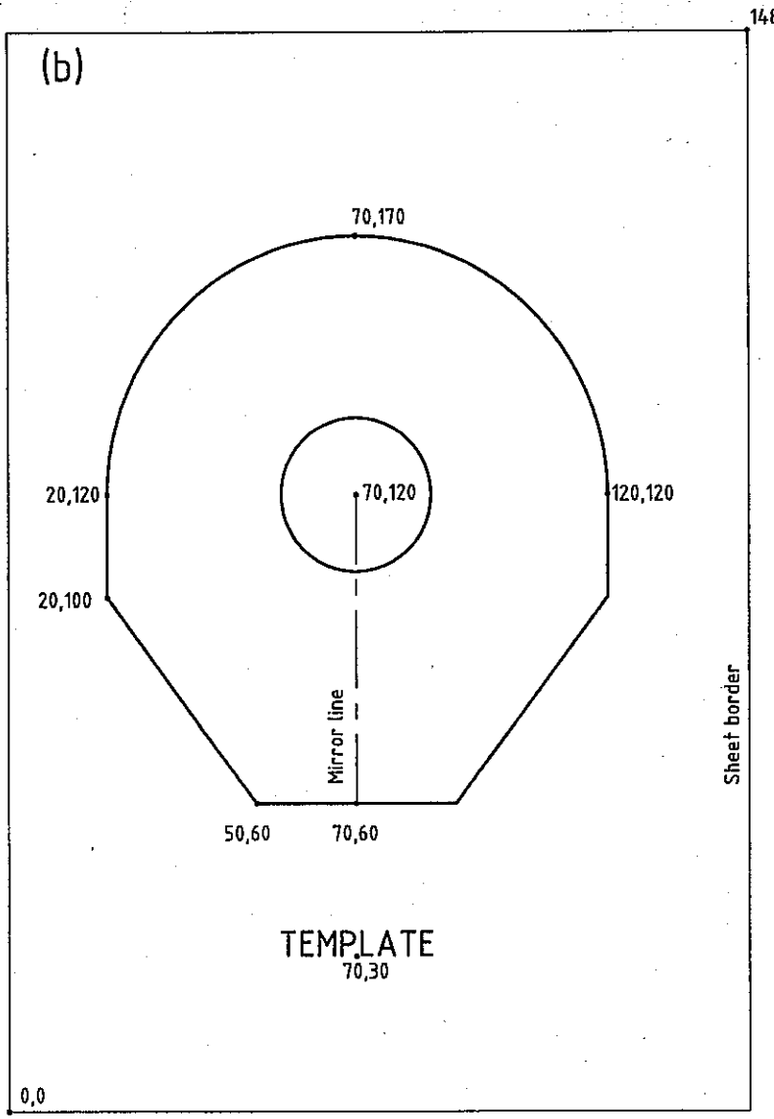
(a)
1 Pan and Zoom Tools
2 World Co-ordinate system icon
3 Minimize window
4 Menu bar
5 Drawing area
6 Crosshairs/Pickbox
7 Co-ordinate display
8 Command window
9 Scroll box
10 Screen menu

(c) (i) TYPICAL CAD WORKSTATION:
64 MB RAM
20 GB Hard disk
19" SVGA Colour Monitor
700 MHz Processor

(ii) Scanner (digitizer also acceptable)

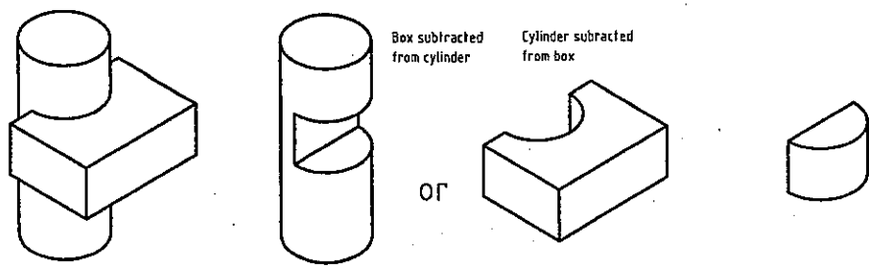
(iii) 56Kbits/sec Modem

(b)



TEMPLATE
70,30

(d)



(e)
1 Trim
2 Fillet
3 Mirror
4 Array (polar)
5 Stretch
6 Ellipse
7 Hatch
8 Circle
9 Array (polar)
10 Polygon
11 Dimension