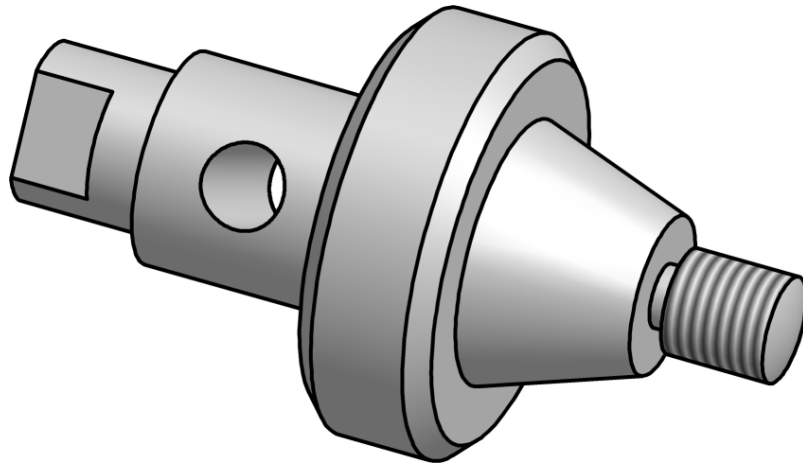




**Coimisiún na Scrúduithe Stáit**  
*State Examinations Commission*

*Leaving Certificate Examination 2005*

***Technical Drawing***  
***Paper 2A - Ordinary Level***  
***(Engineering Applications)***



***Marking Scheme***  
***and Sample Solutions***

*(Other valid solutions are acceptable and marked accordingly)*

# QUESTION 1

(100 MARKS)

## CONCEPTS

<b>A</b>	<b>Assembly</b>	<b>4 marks</b>
<b>B</b>	<b>Sectional Elevation</b>	<b>41 marks</b>
<b>C</b>	<b>Plan</b>	<b>33 marks</b>
<b>D</b>	<b>Additional Requirements</b>	<b>22 marks</b>

### 1A ASSEMBLY 4 Marks

(i)	Bar to Body	1
(ii)	Adjustable Jaw to Bar	1
(iii)	Clamping Screw to Body	1
(iv)	Grub Screw to Jaw	1

### 1B SECTIONAL ELEVATION 41 Marks

#### 1. Body 15 Marks

(i)	Hollow Base	4
(ii)	Fixed Jaw	2
(iii)	Web (left)	2
(iv)	Vertical Body Rib	3
(v)	Top Body	4

#### 2. Adjustable Jaw 6 Marks

(i)	Jaw Face	2
(ii)	Lower Body	2
(iii)	Upper Body	2

#### 3. Clamping Screw 11 Marks

(i)	U'Cut Base	3
(ii)	Screw Shank	2
(iii)	Head	3
(iv)	Tommy Bar	3

#### 4. Grub Screw 3 Marks

(i)	Spud	1
(ii)	Body (thread)	1
(iii)	Slot	1

#### 5. Bar 2 Marks

#### 6. Centre Lines 4 Marks

No. 2	4
-------	---

## 1C PLAN

**33 Marks**

### 1. Body

16 Marks

- |       |              |   |
|-------|--------------|---|
| (i)   | Base Outline | 4 |
| (ii)  | Fillets      | 2 |
| (iii) | Holes        | 2 |
| (iv)  | Web          | 3 |
| (v)   | Top Body     | 4 |
| (vi)  | Rib          | 1 |

### 2. Adjustable Jaw

2 Marks

- |     |         |   |
|-----|---------|---|
| (i) | Outline | 2 |
|-----|---------|---|

### 3. Clamping Screw

7 Marks

- |       |           |   |
|-------|-----------|---|
| (i)   | Left cap  | 1 |
| (ii)  | Left Bar  | 1 |
| (iii) | Head      | 3 |
| (iv)  | Right Bar | 1 |
| (v)   | Right Cap | 1 |

### 4. Bar

4

4 Marks

### 5. Centre Lines

4

4 Marks

## 1D ADDITIONAL REQUIREMENTS

**22 Marks**

- |     |  |   |
|-----|--|---|
| (i) | <b>First or Third Angle Projection</b> | 2 |
|-----|--|---|

2 Marks

### (ii) Title

4 Marks

- |     |                  |   |
|-----|------------------|---|
| (a) | Form             | 1 |
| (b) | Width and Height | 1 |
| (c) | Spacing          | 1 |
| (d) | Appearance       | 1 |

### (iii) ISO Symbol

2

2 Marks

(Incorrect 2 Marks)

### (iv) Dimensioning

4 Marks

- |     |                  |   |
|-----|------------------|---|
| (a) | Projection Lines | 1 |
| (b) | Dimension Lines  | 1 |
| (c) | Arrow Heads      | 1 |
| (d) | Figures          | 1 |

### (v) Presentation

10 Marks

- |           |    |
|-----------|----|
| Excellent | 10 |
| Very Good | 8  |
| Good      | 6  |
| Fair      | 4  |
| Poor      | 2  |

## QUESTION 2

(50 MARKS)

<b>A</b>	<b>Completed Views</b>	<b>18 marks</b>
<b>B</b>	<b>Surface Development of Pipe S</b>	<b>11 marks</b>
<b>C</b>	<b>True Shape of Hole</b>	<b>11 marks</b>
<b>D</b>	<b>Presentation</b>	<b>10 marks</b>

### **2A COMPLETED VIEWS** **18 Marks**

(i)	Pipe R as Given	2
(ii)	Pipe S as Given	2
(iii)	Semicircle Division Elevation	2
(iv)	Semicircle Division End Elevation	2
(v)	Projection of Points to End Elev.	1
(vi)	Plotting of points for Ellipse	2
(vii)	Drawing Ellipse	2
(viii)	Projection of Points from End Elev.	2
(ix)	Plotting of Points in Elevation	2
(x)	Drawing Line of Intersection	1

### **2B SURFACE DEVELOPMENT PIPE S** **11 Marks**

(i)	Projection of Diameter Sections	2
(ii)	Projecting Lengths of Generators	2
(iii)	Plotting Points on Curve	2
(iv)	Drawing Curve	2
(v)	Joint on CC	2
(vi)	Pipe Base (straight line)	1

### **2C TRUE SHAPE OF HOLE** **11 Marks**

(i)	Projection of Widths from Elev,	3
(ii)	Transfer Distances from End Elev,	3
(iii)	Plotting Points of Hole	3
(iv)	Drawing Curve of Hole	2

### **2D PRESENTATION** **10 Marks**

Excellent	10
Very Good	8
Good	6
Fair	4
Poor	2

**Note: Indexing to be considered under this heading**

### QUESTION 3

(50 MARKS)

**3A Cam Profile**

**25 Marks**

**3B Mechanism**

**25 Marks**

### **3A CAM PROFILE**

**25 Marks**

**(a) Displacement Diagram**

**11 Marks**

**(b) Cam Profile**

**11 Marks**

**(c) Presentation**

**3 Marks**

#### **(a) Displacement Diagram**

**11 Marks**

(i)	360° Divisions	1
(ii)	Lift/Travel	1
(iii)	0° to 180° Uniform Acc. & Ret.	3
(iv)	180° to 210° Dwell	1
(v)	210° to 270° Uniform Velocity	1
(vi)	270° to 360° Simple Harmonic Motion	3
(vii)	Drawing of Curve	1

#### **(b) Cam Profile**

**11 Marks**

(i)	Minimum Radius	1
(ii)	Camshaft Diameter	1
(iii)	Maximum Radius	1
(iv)	0° to 180° Uniform Acc. & Ret.	2
(v)	180° to 210° Dwell	1
(vi)	210° to 270° Uniform Velocity	1
(vii)	270° to 360° Simple Harmonic Motion	2
(viii)	Direction of Rotation	1
(ix)	Drawing Profile	1

#### **(c) Presentation**

**3 Marks**

Excellent	3
Good	2
Poor	1

**Note:** Indexing to be considered under this heading

### **3B MECHANISM**

**25 Marks**

- |                          |                 |
|--------------------------|-----------------|
| <b>(a) Line Diagram</b>  | <b>4 Marks</b>  |
| <b>(b) Locus of E</b>    | <b>12 Marks</b> |
| <b>(c) Machine Guard</b> | <b>6 Marks</b>  |
| <b>(d) Presentation</b>  | <b>3 Marks</b>  |

#### **(a) Line Diagram** **4 Marks**

- |               |   |
|---------------|---|
| (i) Crank AB  | 1 |
| (ii) Line LM  | 1 |
| (iii) Link BD | 1 |
| (iv) Arm EC   | 1 |

#### **(b) Locus of E** **12 Marks**

- |                        |   |
|------------------------|---|
| (i) Locus of B         | 2 |
| (ii) Points for B      | 2 |
| (iii) Points for D     | 2 |
| (iv) Points for E      | 4 |
| (v) Drawing Locus of E | 2 |

#### **(c) Machine Guard** **6 Marks**

- |                               |   |
|-------------------------------|---|
| (i) Minimum Clearance         | 4 |
| (ii) Drawing of Guard Outline | 2 |

#### **(d) Presentation** **3 Marks**

- |           |   |
|-----------|---|
| Excellent | 3 |
| Good      | 2 |
| Fair      | 1 |

**Note:** Indexing to be considered under this heading

## QUESTION 4

(50 MARKS)

**4A Dimensional Drawing**

**35 Marks**

**4B Machine Part**

**15 Marks**

### **4A DIMENSIONAL DRAWING**

**35 Marks**

**(a) Shape Description**

**18 Marks**

**(b) Size Description**

**14 Marks**

**(c) Presentation**

**3 Marks**

#### **(a) Shape Description**

**18 Marks**

(i)	Diameter / Length	2
(ii)	Flat	2
(iii)	Diameter / Length	2
(iv)	Hole	1
(v)	Diameter / Length	2
(vi)	Chamfers	2
(vii)	Taper Maximum Diameter	1
(viii)	Taper Minimum Diameter	1
(ix)	Taper Length	1
(x)	Under Cut	1
(xi)	Thread Convention	1
(xii)	Diameter / Length	1
(xiii)	Dome	1

#### **(b) Size Description**

**14 Marks**

(i)	Diameters x 3	2
(ii)	Lengths x 8	2
(iii)	Flat Size / Convention	2
(iv)	Hole Diameter	1
(v)	Chamfer	2
(vi)	Taper Maximum Diameter	1
(vii)	Taper Minimum Diameter	1
(viii)	Under Cut	1
(ix)	Screw Thread Designation	2

#### **(c) Presentation**

**3 Marks**

(i)	Datum	1
(ii)	Centre Line	1
(iii)	Dimensions	1

## **4B MACHINE PART**

**15 Marks**

**(a) Parts List**

**5 Marks**

**(b) Part P**

**4 Marks**

**(c) Pump Operation**

**6 Marks**

**(a) Parts List**

**5 Marks**

(i) Table

1

(ii) Item Number / Name

4

**(b) Part P**

**4 Marks**

(i) Description

2

(ii) Sketch

2

**(c) Pump Operation**

**6 Marks**

(i) Identification of R and S

2

(ii) Sketch

2

(iii) Explanatory Note

2



**QUESTION 5****SECTION A****(50 Marks)****5A Isometric View****38 Marks****5B Engineering Terms****12 Marks****5A ISOMETRIC VIEW****38 Marks****(a) Correct View****4 Marks****(b) Un-Sectioned View****24 Marks****(c) Sectioned View****6 Marks****(d) Presentation****4 Marks****(a) Correct View****4 Marks**

- |     |                      |   |
|-----|----------------------|---|
| (i) | Correct View Point P | 4 |
|     | Oblique (2 Marks)    |   |

**(b) Un-Sectioned View****24 Marks**

- |        |                                   |   |
|--------|-----------------------------------|---|
| (i)    | Base RHS (Width, Height, Opening) | 3 |
| (ii)   | Base Top Right                    | 1 |
| (iii)  | Base Top Left                     | 1 |
| (iv)   | Hole in Base Top Right            | 2 |
| (v)    | Hole in Base Top Left             | 2 |
| (vi)   | Hole in Base Internal             | 1 |
| (vii)  | Side of Centre Rib                | 2 |
| (viii) | Face of Left Web                  | 1 |
| (ix)   | Face of Right Web                 | 1 |
| (x)    | Face of Right Slot                | 1 |
| (xi)   | Top of Right Slot                 | 1 |
| (xii)  | Base of Right Slot                | 1 |
| (xiii) | Side of Back Web                  | 2 |
| (xiv)  | Front of Top Cylinder             | 2 |
| (xv)   | Back of Top Cylinder              | 1 |
| (xvi)  | Intersecting Curve                | 1 |
| (xvii) | Internal Cylinder                 | 1 |

**(c) Sectioned View****6 Marks**

- |       |                     |   |
|-------|---------------------|---|
| (i)   | Front of Base Left  | 1 |
| (ii)  | Front of Base Right | 1 |
| (iii) | Front of Base Hole  | 1 |
| (iv)  | Vertical Rib        | 1 |
| (v)   | Cylinder Face       | 1 |
| (vi)  | Front of Slot Top   | 1 |

**(d) Presentation****4 Marks**

- |           |   |
|-----------|---|
| Excellent | 4 |
| Very Good | 3 |
| Good      | 2 |
| Fair      | 1 |

## 5B ENGINEERING TERMS

12 Marks

- |              |                           |   |                |
|--------------|---------------------------|---|----------------|
| <b>(i)</b>   | <b><i>Split Pin</i></b>   |   | <b>4 Marks</b> |
|              | (a) Eye                   | 1 |                |
|              | (b) Two Pins              | 1 |                |
|              | (c) Sketch                | 2 |                |
| <b>(ii)</b>  | <b><i>Tee Slot</i></b>    |   | <b>4 Marks</b> |
|              | (a) Wide Opening          | 1 |                |
|              | (b) Narrow Opening        | 1 |                |
|              | (c) Sketch                | 2 |                |
| <b>(iii)</b> | <b><i>Curved Slot</i></b> |   | <b>4 Marks</b> |
|              | (a) Inner and Outer Arcs  | 1 |                |
|              | (b) Slot Ends             | 1 |                |
|              | (c) Sketch                | 2 |                |

**QUESTION 5****SECTION B****(50 Marks)****5A Six Commands**

6 x 1

6

**6 Marks****5B Six Commands Explanation**

Sketch

2

Note

1

6 x 3

**18 Marks****5C Cad Terms Explanation**

6 x 2

12

**12 Marks****5D Cad Profile**

- (i) Base Rectangle
- (ii) Lines AB and CD
- (iii) Arc BD
- (iv) Circle Ø12
- (v) Polar Array
- (vi) Polylines EF and FG
- (vii) Presentation

2

2

2

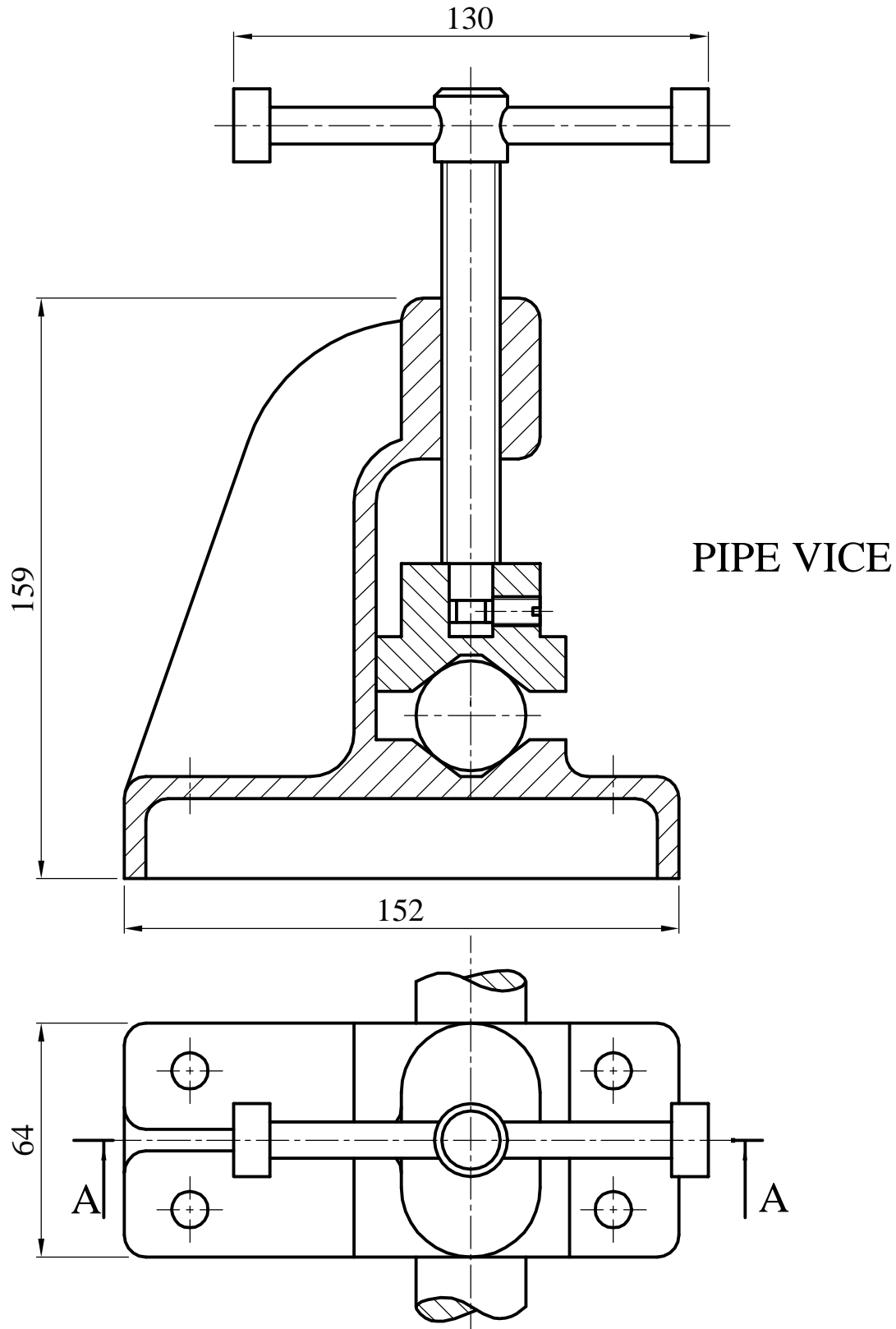
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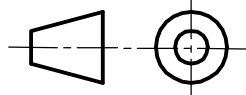
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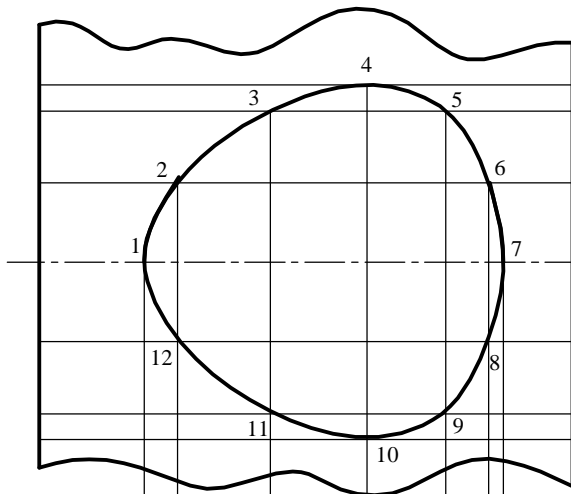
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**14 Marks**

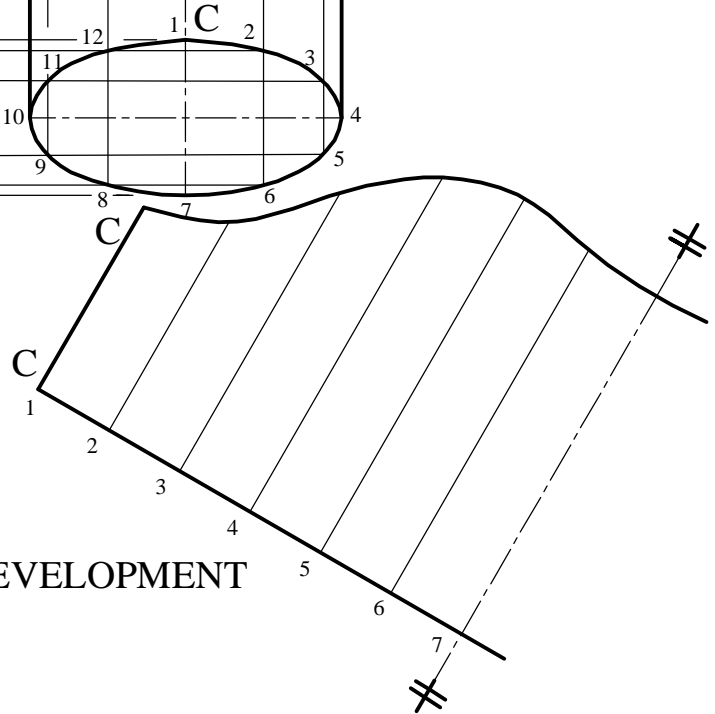
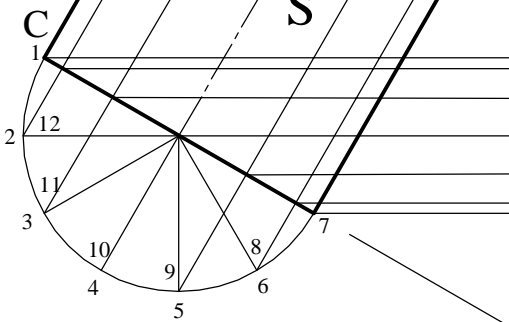
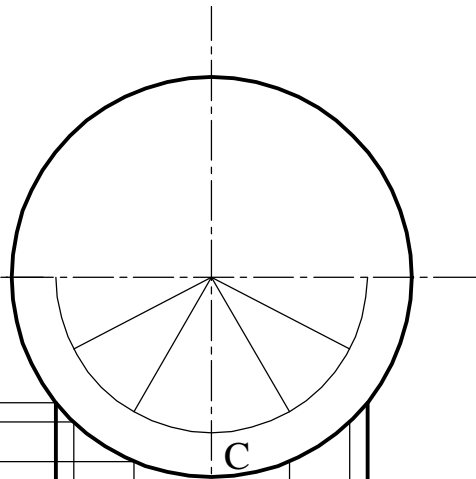
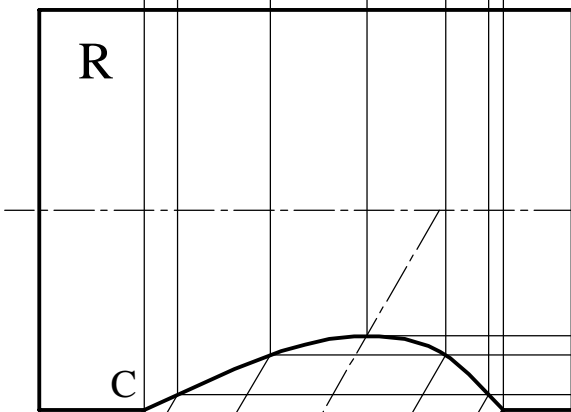


Question 1 (a) & (b)





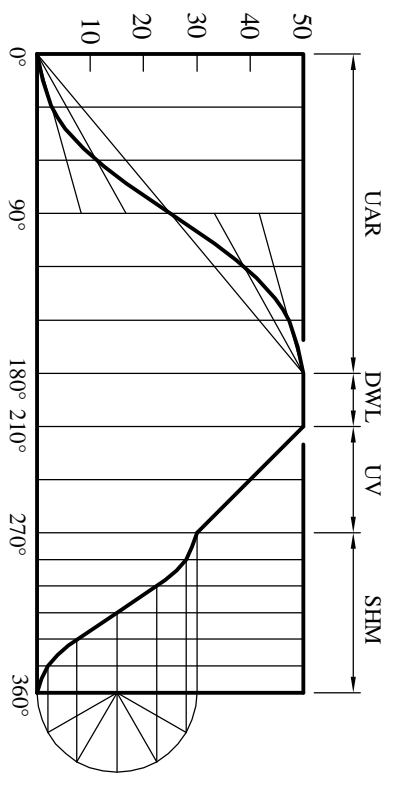
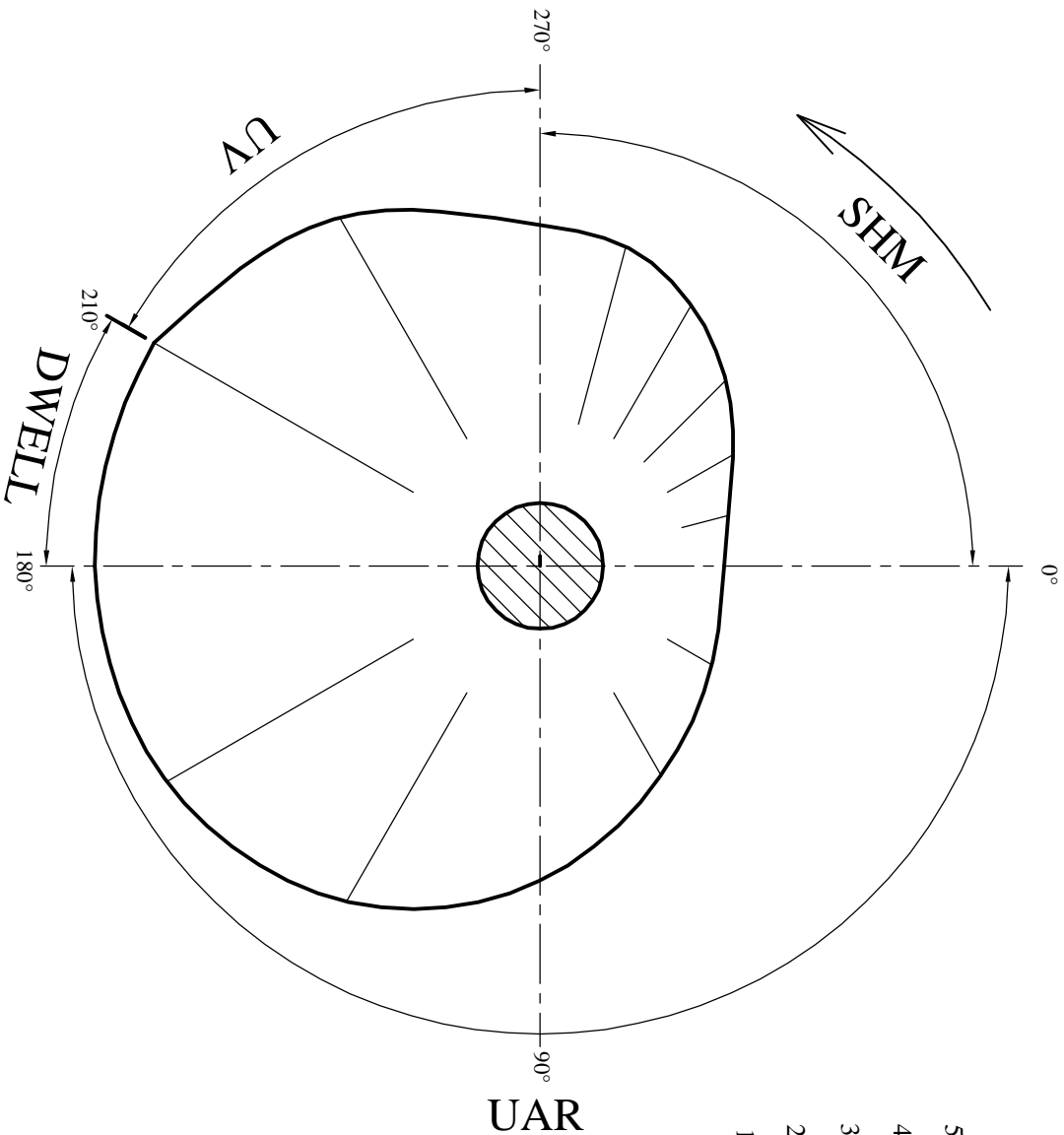
(c) TRUE SHAPE OF HOLE  
IN PIPE R



(a) COMPLETED ELEVATION  
AND END ELEVATION

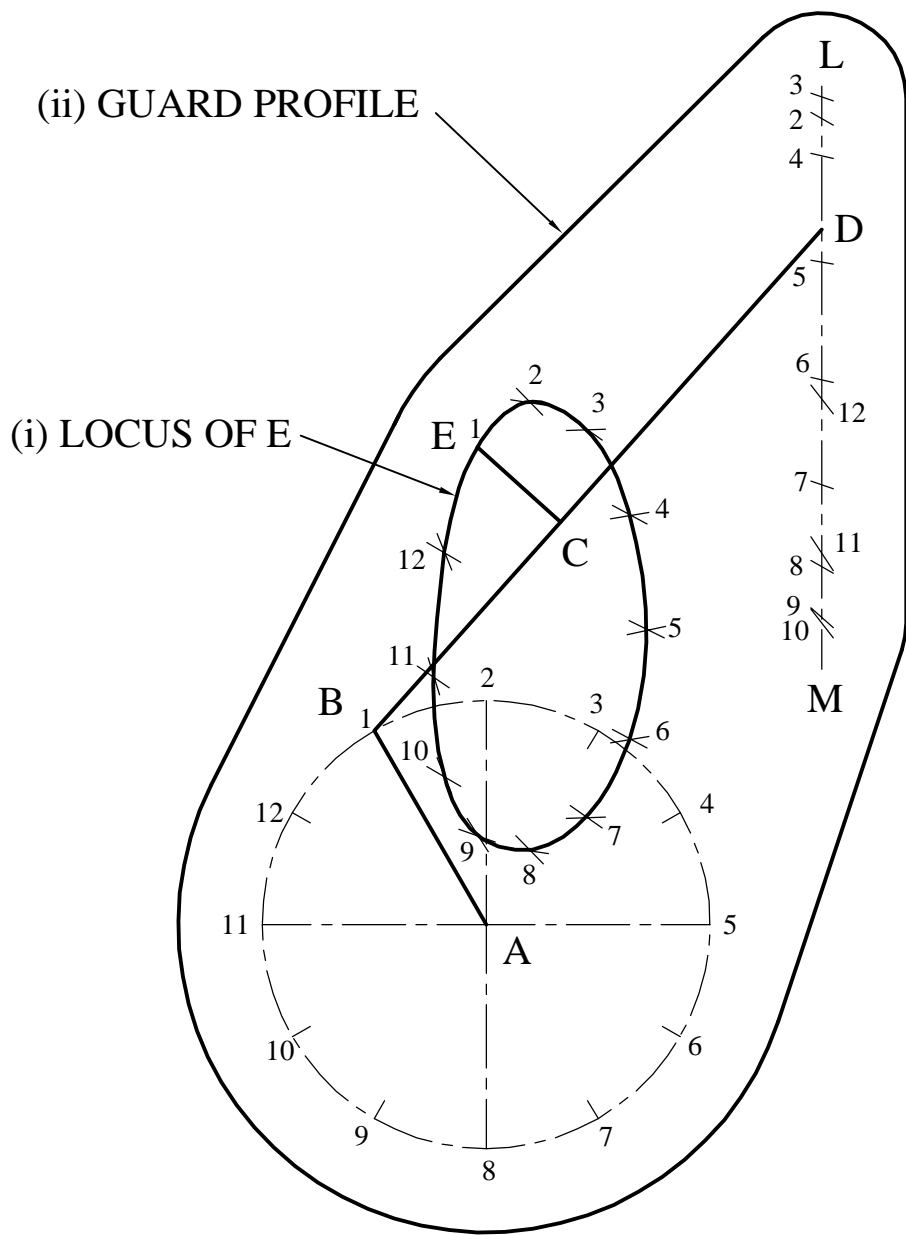
(b) SURFACE DEVELOPMENT  
OF PIPE S

Question 2 (a), (b) & (c)



DISPLACEMENT DIAGRAM

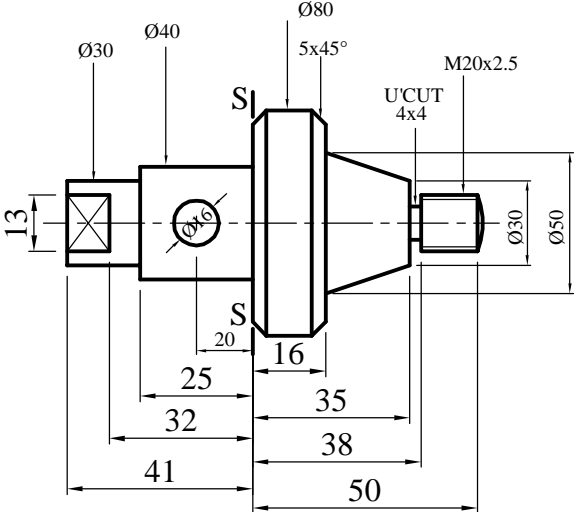
Question 3 (a)



Question 3 (b)

# Question 4(a) & (b)

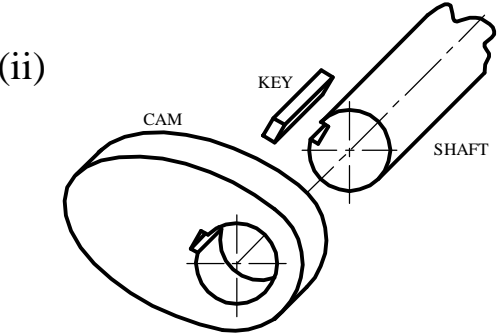
Q4.(a)



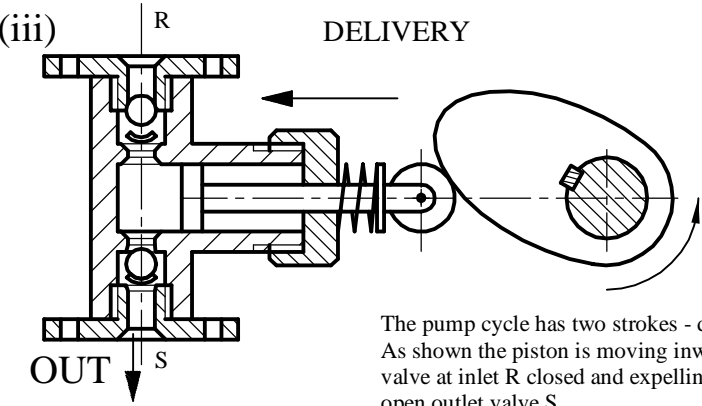
Q4.(b)

(i)

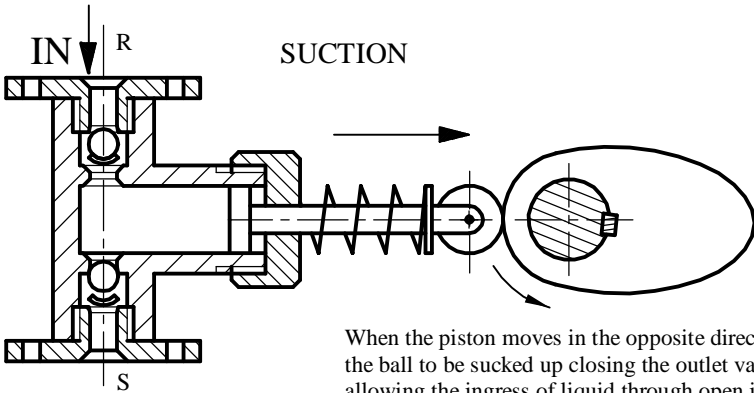
1	CAM
2	ROLLER FOLLOWER
3	SPINDLE/SHAFT
4	PISTON



The purpose of part P - the key is to lock the cam to the shaft and thus provide positive drive.



The pump cycle has two strokes - delivery and suction. As shown the piston is moving inward forcing the ball valve at inlet R closed and expelling liquid through the open outlet valve S.



When the piston moves in the opposite direction it causes the ball to be sucked up closing the outlet valve S and allowing the ingress of liquid through open inlet valve R.



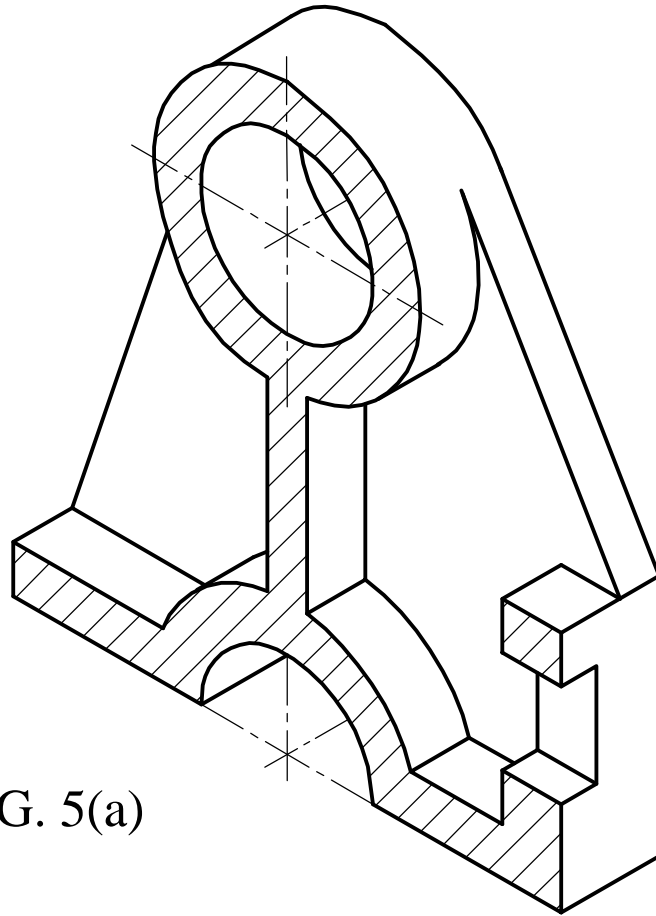
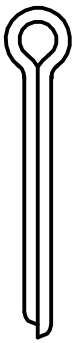


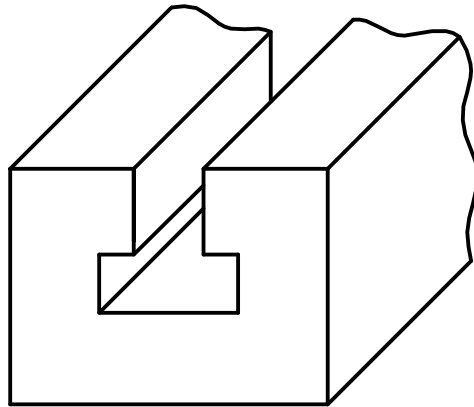
FIG. 5(a)

P

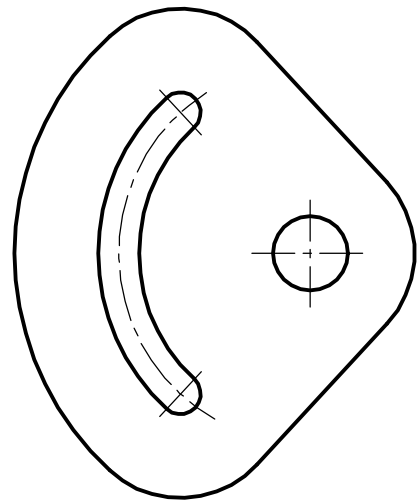
5(b)



(i) SPLIT PIN



(ii) TEE SLOT

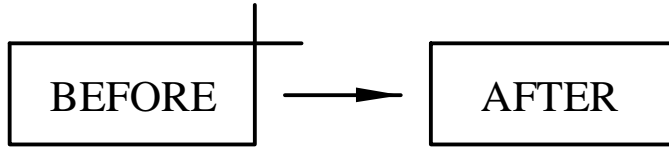


(iii) CURVED SLOT

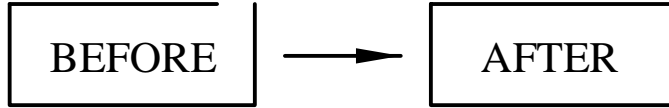
Question 5 Sect.A (a) & (b)

(c)

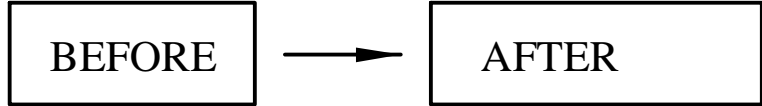
Trim



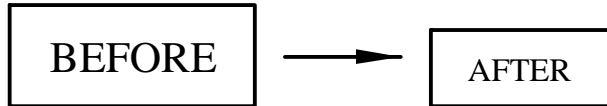
Extend



Stretch



Scale



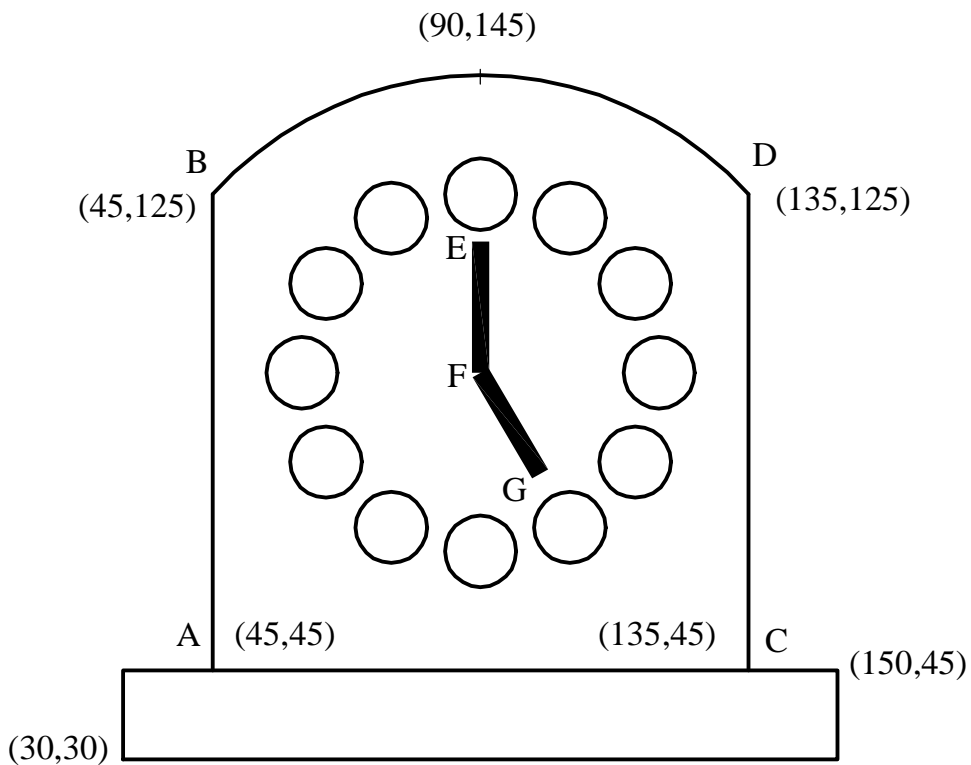
Line

An object produced by directly joining two points together

Polyline

An object composed of one or more connected line segments or arcs and treated as a single object

(d)



Question Sect.B (c) & (d)