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Conic Sections and Special Curves

Aim: To understand and draw conic curves and special curves like cycloid, involute and archimedian spiral.

Software Used: Auto Cad 2022

Procedure:

(1) Set units to millimeters Precision to 0.00.

(2) Set limits

(3) Set Text height to 7mm and width to 1 mm.

Question 1:

(a) **Rectangular Method:**

(1) Make a rectangular box of (66×70 mm) and divide AD into 5 parts and AB into 10 parts and name them.

(2) Join 01', 02', 03', 04' and mark the points of the interaction with the lines from the perpendicular lines drawn from AP. Trim the unnecessary parts.

(3) Make a curve using spline tool starting from P.

(4) Mirror this part of rectangular vios in the other part. Highlight the parabola with bylayer of thickness (0.3mm) and yellow colour.

(b) **Tangent Method:**

(1) Construct a line of 66 mm AB and a perpendicular bisector of AB of height 140 mm and name the top point C. Join AC and BC.

(2) Divide AC and BC into 8 parts and name them.

(3) Join 1'7, 2'6, 3'5, 4'4, 5'3, 6'2, 7'1.

(4) Use spline tool to construct curve and highlight it with bylayer of thickness 0.3 mm and colour - yellow.

Question 2:

(a) Oblong Method:

(1) Construct a rectangular box of (126 × 70 mm) and make four equal parts of it. Divide AB and AD into 10 parts.

(2) Join all the segments in PD to O.

(3) Extend lines from O and using Ray tool. Intersect with the segments drawn to O.

(4) Construct curve starting from P using spline tool.

(5) Mirror the curve in each part of the rectangular box and highlight it.

(b) Concentric Circle Method:

(1) Construct two concentric circles of diameter 126 × 70 m.

(2) Using polar array divide the circle into 8 parts.

(3) Go to line command and draw a horizontal and vertical lines. Use mirror command to replicate it.

(4) Construct a curve around the intersection of horizontal and vertical line using spline tool. Highlight the ellipse formed.

Question 3:

(1) Construct two lines perpendicular to each other and name point of intersection as C, now from point C mark 50 mm distance and name as F. Divide CF into 5 equal parts. From 3 parts, from F mark as V to construct a perpendicular due to CF from V.

(2) Extend a ray from C. Make the ray interact with the perpendicular lines from the segments and trim the unnecessary part.

(3) Construct circles according to the dimensions of the intersected lines from the end. Mark the places where the circles intersects with the line.

(4) Join the points with spline command.

(5) Mirror the above curve below also.

Question 4:

(1) Construct a circle of 36 mm and using polar array divide it into 8 segments.

(2) Extend the end point in the circle till $(\pi \times 36)$ mm and divide it in 8 divisions. Mark it and join it with the lines made from extending above lines.

(3) Copy the circle to next point and mark the intersection of line and circle.

(4) Join the points with spline tool command.

(5) Mirror it on the other half as well.

Question 5:

(1) Construct a pentagon of side of 36 mm and name it.

(2) Construct a circle 2 as center and make a ray from 2 and passing through 1. Keep the curve (part of circle) and trim the rest of the portion.

(3) Now take 2 as center and make a ray from 3 and trim the rest part.

(4) Repeat this process till 5 as center. Change colour of the involute and highlight it.

Question 6:

(1) Construct two circles with 10mm and 66 mm make a line from the center to bigger circle and trim the line inside 10mm circle.

(2) Make the line into 12 parts. Construct arc ⇒ start-center-end. Till the end point with the center.

(3) Leave the point when the first time, the arc ends on last line and then start again till the end point.

(4) Using Spline command join the intersectected parts to form curve.

Result:

(1) (a) The curve obtained is parabola of 66 m base and 70 mm length along the axis.

(b) The curve obtained is parabola of base 66 mm and height 70 mm.

(2) (a) The required ellipse is constructed.

(b) The required ellipse is constructed.

(3) The required hyperbola is constructed.

(4) The required cycloid is constructed.

(5) The required involute of a pentagon is constructed.

(6) Required archimedian sphere is constructed.

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