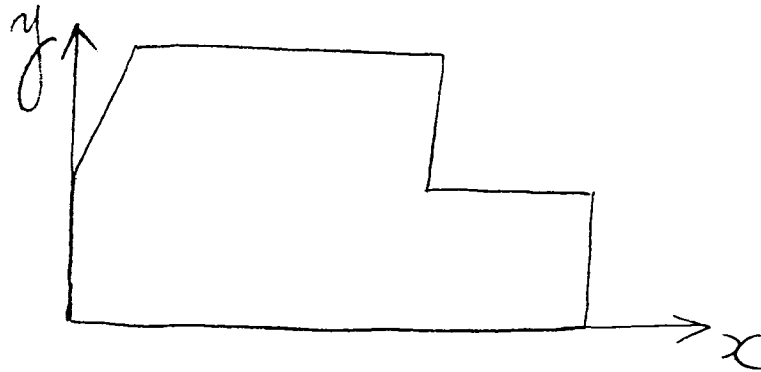


9.9

- (a)  $t_{01} : \frac{23}{64}$  inch diameter drill  
 $t_{02} : \frac{3}{8}$  inch diameter reamer  
 $t_{03} : \frac{1}{4}$  inch diameter drill

(b)



(c)

n000	x 0.000	y 0.000		
RWS				
n001	x 1.000	y 1.000	t01	m03
n002	x 3.000	y 2.000		
n003	x 6.000	y 1.000		
n004	x 7.000			m06
n005			t02	m03
n006	x 6.000			
n007	x 3.000	y 2.000		
n008	x 1.000	y 1.000		m06
n009	x 2.000	y 3.000	t03	m03
n010	x 4.000			m06
n011	x 0.000	y 5.000		m30

9.10 For  $\frac{23}{64}$  inch drill:

$$\text{spindle speed} = \frac{12 \times 75}{\frac{23}{64} \times 3.1416} = 797 \text{ rev/min}$$

$$\text{feed rate} = 0.004 \times 797 = 3.19 \text{ in/min}$$

For  $\frac{3}{8}$  inch reamer:

$$\text{spindle speed} = \frac{12 \times 50}{\frac{3}{8} \times 3.1416} = 509 \text{ rev/min}$$

$$\text{feed rate} = 0.008 \times 509 = 4.07 \text{ in/min}$$

For  $\frac{1}{4}$  inch drill:

$$\text{spindle speed} = \frac{12 \times 75}{\frac{1}{4} \times 3.1416} = 1146 \text{ rev/min}$$

$$\text{feed rate} = 0.004 \times 1146 = 4.58 \text{ in/min}$$

(continue next page)

ME 355 H.W. set #7

9.10 (continue)

n000	x0.000	y0.000				
RWS						
n001	x1.000	y1.000	f3.19	S797	t01	m03
n002	x3.000	y2.000				
n003	x6.000	y1.000				
n004	x7.000					m06
n005			f4.07	S509	t02	m03
n006	x6.000					
n007	x3.000	y2.000				
n008	x1.000	y1.000				m06
n009	x2.000	y3.000	f4.58	S1146	t03	m03
n010	x4.000					m06
n011	x0.000	y5.000				m30

## ME 355 H.W. Set #7

9.12

Let  $\frac{23}{64}$  inch drill be called by TURRET/01 $\frac{3}{8}$  inch reamer be called by TURRET/02 $\frac{1}{4}$  inch drill be called by TURRET/03

The APT program for the problem is:

PARTNO PART FIGURE P9.9

MACHIN/DRILL, 1

CLPRINT

P0 = POINT/0, 5, 0

P1 = POINT/1, 1, 0

P2 = POINT/3, 2, 0

P3 = POINT/6, 1, 0

P4 = POINT/7, 1, 0

P5 = POINT/2, 3, 0

P6 = POINT/4, 3, 0

TURRET/01

SPINDL/797

FEDRAT/3.19

FROM/P0

GOTO/P1

GODLTA/0, 0, -1

GODLTA/0, 0, 1

GOTO/P2

GODLTA/0, 0, -1

9.12 (continue)

GODLTA/0,0,1  
GOTO/P3  
GODLTA/0,0,-1  
GODLTA/0,0,1  
GOTO/P4  
GODLTA/0,0,-1  
GODLTA/0,0,1  
TURRET/02  
SPINDL/509  
FEDRAT/4.07  
GODLTA/0,0,-1  
GODLTA/0,0,1  
GOTO/P3  
GODLTA/0,0,-1  
GODLTA/0,0,1  
GOTO/P2  
GODLTA/0,0,-1  
GODLTA/0,0,1  
GOTO/P1  
GODLTA/0,0,-1  
GODLTA/0,0,1  
TURRET/03  
SPINDL/1146  
FEDRAT/4.58

9.12 (continue)

```

GOTO/P5
GODLTA/0, 0, -1
GODLTA/0, 0, 1
GOTO/P6
GODLTA/0, 0, -1
GODLTA/0, 0, 1
RAPID
GOTO/P0
FINI

```

9.15

The points, lines, and circles are designated as shown in the figure with the coordinate system.

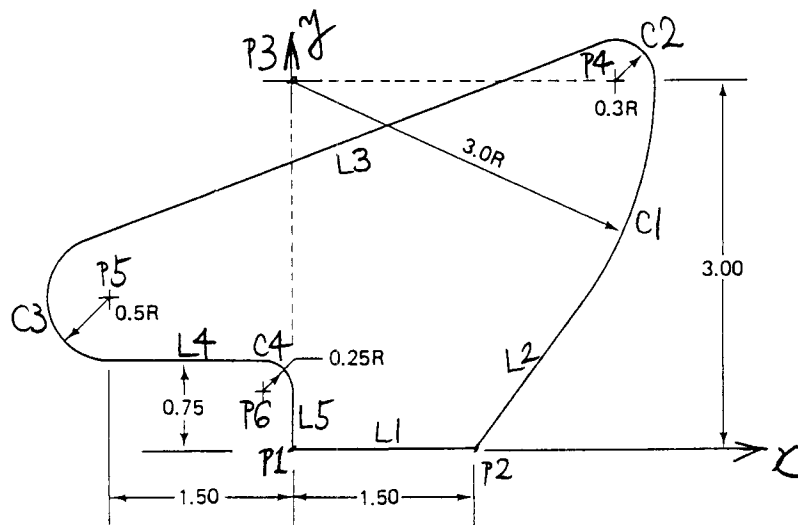


FIGURE P9.15

9.15 (a)

APT geometry statements :

$$P0 = \text{POINT}/-1, -2, 0$$

$$P1 = \text{POINT}/0, 0, 0$$

$$P2 = \text{POINT}/1.5, 0, 0$$

$$P3 = \text{POINT}/0, 3, 0$$

$$P4 = \text{POINT}/2.7, 3, 0$$

$$P5 = \text{POINT}/-1.5, 1.25, 0$$

$$P6 = \text{POINT}/-0.25, 0.5, 0$$

$$C1 = \text{CIRCLE}/\text{CENTER}, P3, \text{RADIUS}, 3.0$$

$$C2 = \text{CIRCLE}/\text{CENTER}, P4, \text{RADIUS}, 0.3$$

$$C3 = \text{CIRCLE}/\text{CENTER}, P5, \text{RADIUS}, 0.5$$

$$C4 = \text{CIRCLE}/\text{CENTER}, P6, \text{RADIUS}, 0.25$$

$$L1 = \text{LINE}/P1, P2$$

$$L2 = \text{LINE}/P2, \text{RIGHT}, \text{TANTO}, C1$$

$$L3 = \text{LINE}/\text{LEFT}, \text{TANTO}, C2, \text{LEFT}, \text{TANTO}, C3$$

$$L4 = \text{LINE}/\text{RIGHT}, \text{TANTO}, C3, \text{LEFT}, \text{TANTO}, C4$$

$$L5 = \text{LINE}/P1, \text{RIGHT}, \text{TANTO}, C4$$

$$PL1 = \text{PLANE}/P1, P2, P3$$

9.15 (b) APT motion statements:

FROM/PO

GO/TO, L1, TO, PNI, TO, L2

GORG/TO, L1, PAST, L2

GOLEFT/L2, TANTO, C1

GOFWD/C1, TANTO, C2

GOFWD/C2, TANTO, L3

GOFWD/L3, TANTO, C3

GOFWD/C3, TANTO, L4

GOFWD/L4, TANTO, C4

GOFWD/C4, TANTO, L5

GOFWD/L5, PAST, L1

GOTO/PO

(c) PARTNO PART FIGURE P.9.15

MACHIN/MILL, 01

CLPRINT

INTOL/0.0005

OUTTOL/0.0005

CUTTER/0.500

PO = POINT/-1, -2, 0

PI = POINT/0.000



9.15 (continue)

P2 = POINT/1.5, 0, 0  
 P3 = POINT/0, 3, 0  
 P4 = POINT/2.7, 3, 0  
 P5 = POINT/-1.5, 1.25, 0  
 P6 = POINT/-0.25, 0.5, 0  
 C1 = CIRCLE/CENTER, P3, RADIUS, 3.0  
 C2 = CIRCLE/CENTER, P4, RADIUS, 0.3  
 C3 = CIRCLE/CENTER, P5, RADIUS, 0.5  
 C4 = CIRCLE/CENTER, P6, RADIUS, 0.25  
 L1 = LINE/P1, P2  
 L2 = LINE/P2, RIGHT, TANTO, C1  
 L3 = LINE/LEFT, TANTO, C2, LEFT, TANTO, C3  
 L4 = LINE/RIGHT, TANTO, C3, LEFT, TANTO, C4  
 L5 = LINE/P1, RIGHT, TANTO, C4  
 PNI = PLANE/P1, P2, P3

SPINDL/500

FEDRAT/3.0

FROM/p0

GO/TO, L1, TO, PNI, TO, L2

GORGT/L1, PAST, L2

GOLFT/L2, TANTO, C1

GOFWD/C1, TANTO, C2

GOFWD/C2, TANTO, L3

GOFWD/L3, TANTO, C3

ME 355

H.W. set #7

P.10

GO FWD/C3, TANTO, L4

GO FWD/L4, TANTO, C4

GO FWD/C4, TANTO, L5

GO FWD/L5, PAST, L1

GOTO/PO

FINI