HW 02: APT PROGRAMMING

NAME: SOLN KEY FOR APT

The following workpiece is to have a finishing pass around its periphery (see NC Programming Notes, Figure 1).

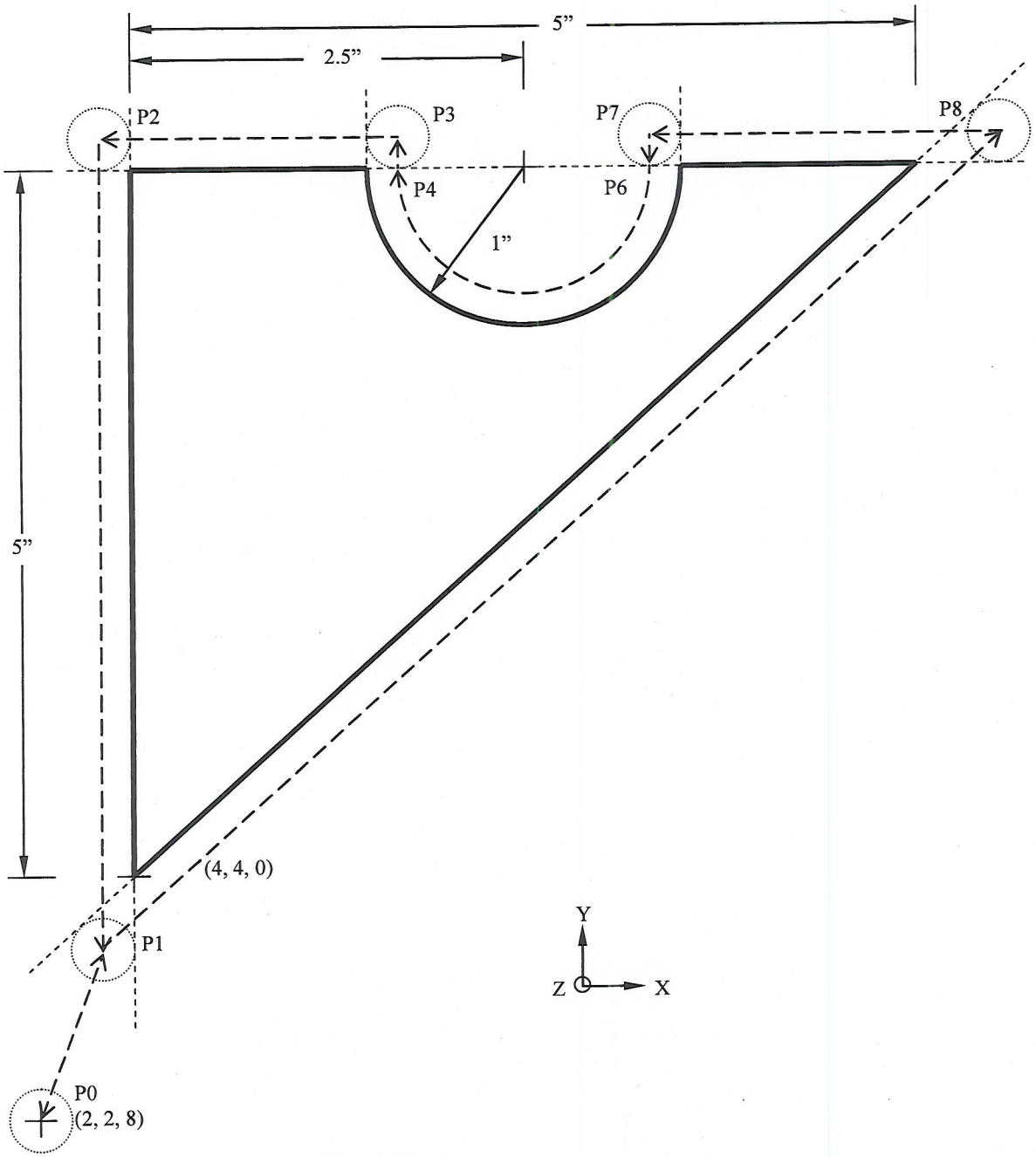


Figure 1. Workpiece for APT machining.

(HW questions are on the reverse side of this page.)

Questions:

1. Set up and create an APT program that profiles the part in Figure 1 in a counter-clockwise direction: (a) using full circle interpolation (i.e. use the points indicated, above); and (b) utilizes a coolant to flush chips from the surfaces. *Hint: NONE of the points (P0 – P 8) are needed from the NC part in HW 01 ... and neither are the moves from P7 – P6 or from P4 – P3.*

   The pertinent machining data is: (a) cutter diameter is 0.25 inches; (b) feed rate is 6 inches per minute; (c) cutting speed is 300 surface feet per minute; (d) the tool home position is at (2, 2, 8); and (e) the part home position is at (4, 4, 0), referencing the ***lower,*** left corner of the top of the workpiece. (Adapted from Chang, T. C., Wysk, R. A., & Wang, H. P. (1991). *Computer-Aided Manufacturing.* Englewood Cliffs, NJ: Prentice-Hall. pp. 253-255.)

   Hint: You can save yourself a lot of geometry if you look at the calculations on the NC Programming Handout

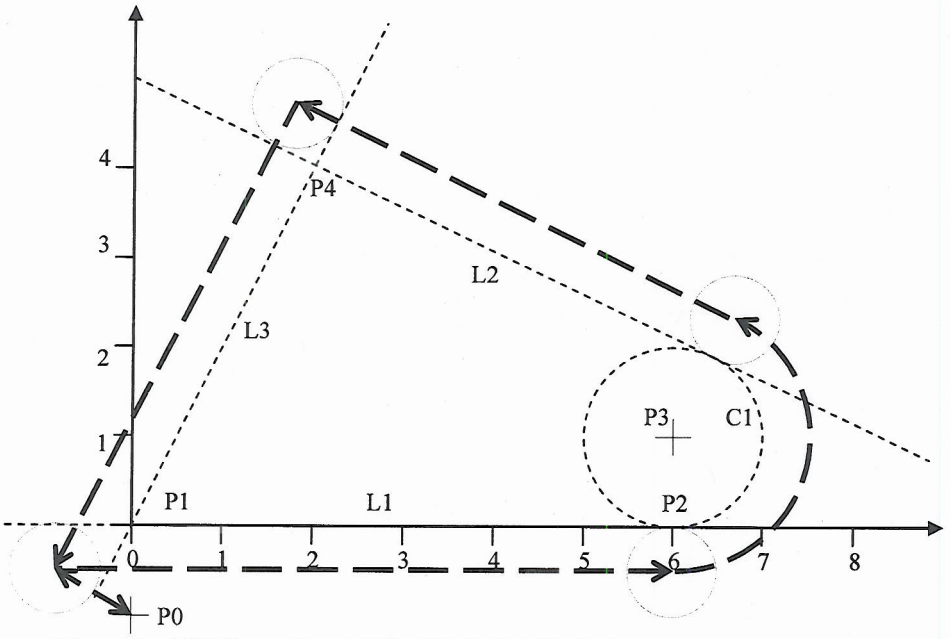


Figure 2. APT Geometry and Tool Path for Workpiece

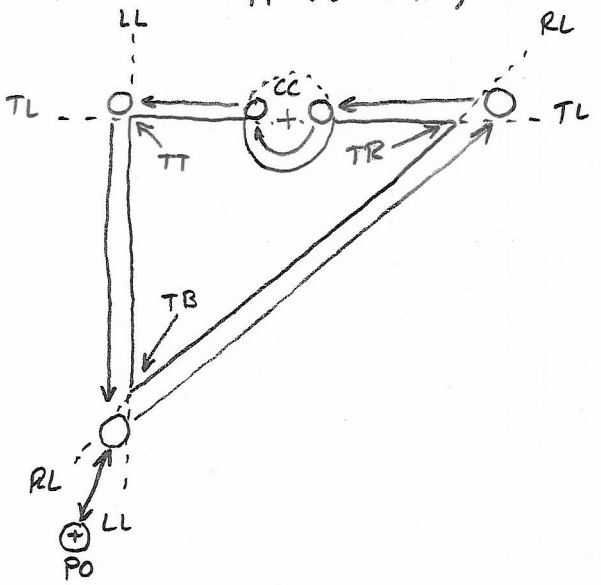
2. An APT program for the profiling of the part in Figure 2 (see the APT Programming Notes) is to be generated. (See the APT Programming Notes) The processing parameters are: (a) feed rate is 5.39 inches per minute; (b) spindle speed is 573 revolutions per minute; (c) a coolant is to be used to flush the chips; (d) the cutter diameter is to be 0.5 inches, (e) depth of cut is 1 inch relative to the top of the part (at Z=0), and (f) the tool home position is (0, -1, 0). (Adapted from Groover, M. P. (1980). *Automation, Production Systems, and Computer-Aided Manufacturing.* Englewood Cliffs, NJ: Prentice-Hall. pp. 253-255.)

   Hint: You can save yourself a lot of work if you look at the program on the APT Programming Handout

3. Assuming that you had to write the programs from scratch, which programming method would be easiest to use to create the part in Question 1 (NC or APT programming)?

Attach your work on EP Paper to this sheet and submit by the due date.

1.) $N = \frac{V}{\pi D} = \frac{(300\ FT/MIN)(12\ IN/FT)}{\pi\ (.25\ IN)} = 4584\ RPM$

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PARTNO APTQ1
MACHIN/ MILL,1
CUTTER/ 0.25
P0 = POINT/ 2.0, 2.0, 8.0
TB = POINT/ 4.0, 4.0, 0.0
TR = POINT/ 9.0, 9.0, 0.0
TT = POINT/ 4.0, 9.0, 0.0
CC = POINT/ 6.5, 9.0, 0.0
C1 = CIRCLE/ CENTER, CC, RADIUS, 1.0
PL1 = PLANE/ TB, TR, TT
RL = LINE/ TB, TR
TL = LINE/ TT, TR
LL = LINE/ TB, TT
SPINDL/ 4584
FEDRAT/ 6.0
COOLNT/ ON
FROM/ P0
GO/TO, RL, TO, PL1, TO, LL
GORGT/ RL, PAST, TL
GOLFT/ TL, PAST, C1
GOLFT/ C1, PAST, TL
GOLFT/ TL, PAST, LL
GOLFT/ LL, PAST, RL
RAPID
GOTO/ P0
COOLNT/ OFF
FINI
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2)
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PARTNO APT@2
MACHIN/ MILL, 1
CUTTER/ 0.5000
P0 = POINT/ 0, -1.0, 0
P1 = POINT/ 0, 0, 0
P2 = POINT/ 6.0, 0, 0
P3 = POINT/ 6.0, 1.0, 0
P4 = POINT/ 2.0, 4.0, 0
C1 = CIRCLE/ CENTER, P3, RADIUS, 1.0
L1 = LINE/ P1, P2
L2 = LINE/ P4, LEFT, TANTO, C1
L3 = LINE/ P1, P4
PL1 = PLANE/ P1, P2, P3
SPINDL/ 573
FEDRAT/ 5.39
COOLNT/ ON
FROM/ P0
GO/ TO, L3, TO, PL1, TO, L1
GORGT/ L1, ON, P2
GOFWD/ C1, PAST, L2
GOFWD/ L2, PAST, L3
GOLFT/ L3, PAST, L1
RAPID
GOTO/ P0
COOLNT/ OFF
FINI
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(SEE DIAGRAM FOR FIGURE 2)

3.) WITHOUT HAVING THE CUTTER CENTER POINTS OR THE TANGENCY POINTS CALCULATED FOR US, IT IS PROBABLY EASIER AND LESS ERROR PRONE TO WRITE THE APT CODE.