

1. (a)

Required gear ratio

$$V = rpm \times K_G \times 1$$
$$K_G = \frac{1000 \left( \frac{mm}{min} \right)}{1800 \times 1} = 0.556$$

$$(b) \text{ Encoder gain} = \frac{1}{\text{BLU}} = \frac{1}{0.01} = 100$$

$$(c) \text{ Freq} = \frac{100 \times 1000}{60} = 1,667$$

(d)

Max. travel length

$$= (2^{16} - 1) \times \text{BLU}$$

$$= (2^{16} - 1) \times 0.01 = 655.35\text{mm}$$

2.

G<sub>0</sub> X0Y0 → X200Y150

$$\text{distance} = \sqrt{200^2 + 150^2} = 250$$

$$\bullet \text{ acceleration time} = \frac{100}{40} = 2.5 \text{ sec}$$

$$\text{distance} = \frac{2.5 \times 100}{2} = 125 \text{ mm}$$

$$\bullet \text{ deceleration time} = \frac{100 - \frac{10}{60}}{40} = 2.496 \cong 2.5 \text{ sec}$$

$$\text{distance} \cong 125 \text{ mm}$$

G<sub>1</sub> X30Y20

$$\text{distance} = \sqrt{30^2 + 20^2} = 36.06$$

$$\text{time} = \frac{36.06 \times 60}{10} = 216.36 \text{ sec}$$

G<sub>2</sub> X40Y0R20

$$\text{distance} = \pi \cdot r = \pi \times 20 = 62.83$$

$$\text{time} = \frac{62.83 \times 60}{10} = 376.98 \text{ sec}$$

G<sub>2</sub> X-20Y-20R20

$$\text{time} = \frac{376.98}{2} = 188.5 \text{ sec}$$

$$\text{G1 X-50 time} = \frac{50 \times 60}{10} = 300 \text{ sec}$$

G<sub>0</sub> X0Y0 : 5 sec

$$\text{Total time} = 2 \times 5 + 216.36 + 376.98 + 188.5 + 300 = 1091.4 \text{ sec}$$

3.

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PARTNO      P1534
            MACHINE/MILL,4
P0          =POINT/0,0,0.1
P1          =POINT/1,1,0.5
P2          =POINT/4,3.5,0.5
P3          =POINT/5.85,2.85,0.5
P4          =POINT/5,1.85,0.5
P5          =POINT/2,2.5,0.5

PL1         =PLANE/P1,P2,P3
PL2         =PLANE/PARLEL,PL1,ZSMALL,0.5

C1          =CIRCLE/CENTER,P4,RADIUS,0.85
C2          =CIRCLE/CENTER,P5,RADIUS,1.0

L1          =LINE/P1,RIGHT,TANTO,C1
L2          =LINE/P3,LEFT,TANTO,C1
L3          =LINE/P2,P3
L4          =LINE/P2,RIGHT,TANTO,C2
L5          =LINE/P1,LEFT,TANTO,C2

MILLS      =MACRO/CUT,SSP,FRT
            CUTTER/CUT
            FEDRAT/FRT
            SPINDL/SSP
            FROM/P0
            GO/TO,L1,TO,PL2,TO,L5
            GORGT/L1,TANTO,C1
            GOFWD/C1,TANTO,L2
            GOFWD/L2,PAST,L3
            GOLFT/L3,PAST,L4
            GOFWD/L4,TANTO,C2
            GOFWD/C2,TANTO,L5
            GOFWD/L5,PAST,L1
            GOTO/P0
            TERMAC

            TURRET/4
            CALL/MILLS/CUT=0.52,SSP=600,FRT=3.0
            TURRET/6
            CALL/MILLS/CUT=0.50,SSP=900,FRT=2.0
            SPINDL/0
            END
            FINI
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