

Problem 1

a)

$$v = \pi * D * \frac{N}{12}$$
$$125 = \pi * 3.0 * \frac{N}{12}$$
$$N = 159 \text{ RPM}$$

b)

$$f = f_t * n_t * N$$
$$f = 0.006 * 10 * 159$$
$$f = 9.54 \text{ ipm}$$

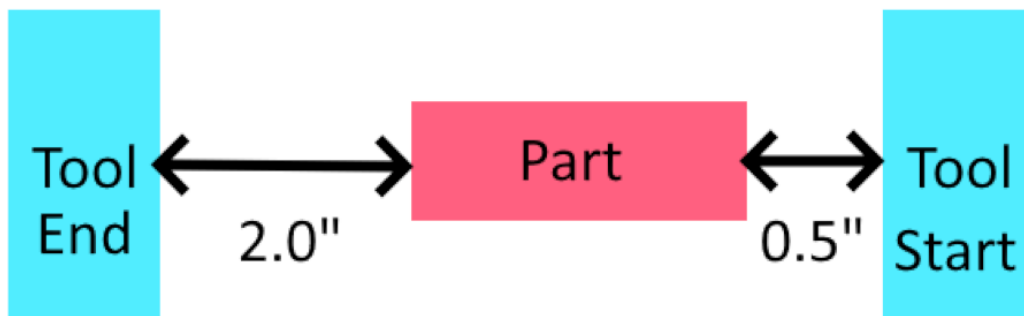
c)

$$T_m = \frac{L + A + 0.3}{f}$$
$$T_m = \frac{12 + \sqrt{0.3(3 - 0.3)} + 0.3}{9.54}$$
$$T_m = 1.384 \text{ s}$$

d)

$$Q = w * d * f$$
$$Q = 2.5 * 0.3 * 9.54$$
$$Q = 7.155 \frac{\text{in}^3}{\text{min}}$$

e)



$$T_f = \frac{L + 0.5 + 2}{f}$$

$$T_f = \frac{12 + 0.5 + 2}{9.54}$$

$$T_f = 1.52 \text{ s}$$

Or, including the time required to lower the cutter to the desired depth:

$$T_f = \frac{L + 0.5 + 2 + 0.3}{9.54}$$

$$T_f = \frac{12 + 0.5 + 2 + 0.3}{9.54}$$

$$T_f = 1.55 \text{ s}$$

Problem 2

a)

$$v = \pi * D * \frac{N}{12}$$

$$100 = \pi * 3.5 * \frac{N}{12}$$

$$N = 109 \text{ RPM}$$

b)

$$f = f_t * n_t * N$$

$$f = 0.010 * 8 * 109$$

$$f = 8.72 \text{ ipm}$$

c)

$$A = O = \frac{D}{2}$$

$$= \frac{3.5}{2}$$

$$= 1.75"$$

$$T_m = \frac{L + 2A}{f}$$

$$T_m = 1.548 \text{ s}$$

d)

$$Q = w * d * f$$

$$Q = 3 * \frac{15}{64} * 8.72$$

$$Q = 6.131 \frac{\text{in}^3}{\text{min}}$$

e)

$$P_S = P_U * Q$$

$$P_S = 1 * 6.131$$

$$P_S = 6.131 \text{ HP}$$

$$T_S = \frac{63030 \text{ hp}_S}{\text{RPM}}$$

$$T_S = \frac{6030 * 6.131}{109}$$

$$T_S = 339.2 \text{ in} * \text{lb}$$

Problem 3

a)

$$\text{hp}_S = \frac{Q}{K}$$

$$5 = \frac{Q}{3.25}$$

$$Q = 16.25 \frac{\text{in}^3}{\text{min}}$$

b)

$$f = f_t * n_t * N$$

$$f = 0.013 * 16 * 200$$

$$f = 41.6 \text{ ipm}$$

c)

$$Q = w * d * f$$

$$16.25 = 0.75 * d * 41.6$$

$$d = 0.521''$$

d)

$$v = \pi * D * \frac{N}{12}$$

$$425 = \pi * D * \frac{200}{12}$$

$$D = 8.12''$$