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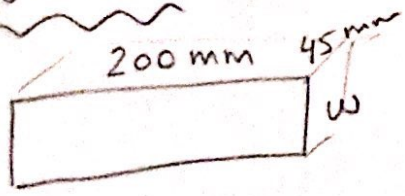
Quiz 5



$T_m = 0.4 \text{ min} \times \frac{60 \text{ sec}}{1 \text{ min}} = 24 \text{ secs}$

4 teeth $D = w$

$v = 4.5 \text{ m/s} = 4.5 \text{ m/s} \times \frac{1000 \text{ mm}}{1 \text{ m}} = 4.5 \times 10^3 \text{ mm/s}$

chip load = 0.1 mm/tooth

5 mm from top surface

$$A = 0.5\left(D - \sqrt{(D^2 - W^2)}\right)$$

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

$$N = \frac{4.5 \times 10^3}{\pi D}, \quad f_r = N n_t f$$

$$f_r = \frac{4.5}{\pi D}(4)(0.1)$$

$$f_r = \frac{1800}{\pi D}$$

$$A = 0.5\left(D - \sqrt{(D^2 - D^2)}\right)$$

$$A = 0.5D$$

$$T_m = \frac{L + A}{f_r}$$

$$24 = \frac{200 + 0.5D}{\frac{1.8 \times 10^3}{\pi D}}$$

$$24 \times \frac{1,800}{\pi D} = 200 + 0.5D$$

$$\pi D\left[\frac{43,200}{\pi D}\right] = \left[200 + 0.5D\right]\pi D$$

$$43,200 = 200\pi D + 0.5\pi D^2$$

$$0 = 0.5\pi D^2 + 200\pi D - 43,200$$

$$D = 59.81 \text{ mm}$$

or

$$D = -459.811 \text{ mm (not accepted)}$$

$$\boxed{D = w = 59.81 \text{ mm}}$$