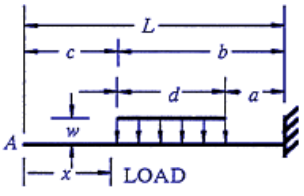
Assignment #2 Solution

Q1)

1. Increasing the stiffness by shorten the tool length (reducing tool stick-out from the tool holder), increasing cutter diameter, changing number of flutes, switching from an HSS to a carbide cutter.
2. Reducing feed rate

Q2) The maximum deflection is about 0.16mm; therefore, the final part has a tolerance of +0.16mm

$$y_{max} = -\frac{w}{24EI}[4L(b^3 - a^3) - (b^4 - a^4)]$$



Q3) $\Delta K = 1.5K_y\left(1 - \frac{1}{3}(\frac{K_y}{K_L})^2\right)$

$K_{final} = K_L - \Delta K$

Yield curvature: $K_y = \frac{\sigma_y}{E\frac{h}{2}}$, K_L: Mold curvature (1/R)

Results: R1= 1.2m, R2=2.72m, R3=9.34m

Q4)

$$t_{cool} = \frac{h^2}{10\alpha}\ln\left(\frac{4}{\pi}\frac{T_m - T_w}{T_e - T_w}\right), \qquad \alpha = \frac{K}{\rho C_p}$$

$$t_{cool} = 0.8542 \text{ sec}$$

$The\ cooling\ time \propto h^2$ so the required time will be ¼ times shorter

$$t_{cool,new} = \frac{1}{4}0.8542 = 0.2135 \text{ sec}$$