51. A random force $F \sim N(30,\ 3^2)$ kN is applied to a brittle thin plate. The plate has a width of $w = 200$ mm and a hole in the center with a diameter of $d = 20$ mm. The stress concentration factor is $K_t = 2.7$ and the yield strength of the plate is $S_y \sim N(600, 6^2)$ MPa. If the maximum probability of failure is designed to be $p_f = 10^{-5}$, estimate the minimum thickness of the plate using the First Order Second Moment Method.

Answer: $t = 1.1$ mm