3-5. A random torque $T \sim N(15, 2^2)\ \mathrm{N \cdot m}$ is applied on a step shaft as shown. The shaft has an allowable shear stress $\tau_a \sim N(20, 1.5^2)\ \mathrm{MPa}$. Determine the probability of failure of the shaft. Given that the torsional stress-concentration factor is $K = 1.25$. Assume that T and τ_a are independent. (**Ans.** $p_f = 1.31 \times 10^{-4}$)