

10. A ductile shaft is subjected to a torque $T \sim N(800, 80^2)$ N·m. The yield strength in tension is $S_{yt} \sim N(200, 20^2)$ MPa and the one in compression is $S_{yc} \sim N(150, 10^2)$ MPa. If the maximum probability of failure is designed to be $p_f = 10^{-5}$, determine the minimum diameter of the shaft. Assume that T , S_{yt} and S_{yc} are independent.

Answer: $d = 42.1$ mm, $d_{preferred} = 45$ mm