13. A toruqe $T \sim N(400,\ 20^2)$ N·m is applied to a ductile shaft. The diameter of the shaft is $d = 25$ mm. If the yield strength in compression is $S_{yc} \sim N(300,\ 20^2)$ MPa and the yield strength in tension is $S_{yt} \sim N(400,\ 20^2)$ MPa, and T, S_{yt} and S_{yc} are independent, determine the probability of failure using the First Order Second Moment Method.

Answer: $p_f = 1.80(10^{-5})$