Homework 3

The position of a slider-block linkage is required to be $l_{3a} = 2.96$ m when $\theta = 20^\circ$. A failure occurs if the actual position l_3 is outside the tolerance range $l_{3a} \pm 0.015$ m. The design variables are independent and follow normal distributions of $l_1 \sim N(2, 0.003^2)\text{m}$, $l_2 \sim N(1, 0.002^2)\text{m}$. Since uncertainty exists in the measurement of θ, the angle also follows a normal distribution with $\theta \sim N(20^\circ, (0.1^\circ)^2)$. The measurement uncertainty is independent of that in the mechanism dimensions. Use the First Order Second Moment (FOSM) method to calculate the probability of failure.

(**Ans.** $p_f = 3.2879 \times 10^{-5}$)