Uncertainty in Electrical Components

Group Assignment

Resistor Production

In production of 100Ω resistors, the resistance of each resistors will be a random variable that is Gaussian distributed with a mean of 100Ω, and a standard deviation of σ.
The resistors are sorted in 5% and 10% resistors. Thus all resistors within 5% of 100Ω are sorted in one package, and resistors between 5% and 10% are sorted in another package. Resistors deviating more than 10% are discarded.

Questions

1. Begin by assuming that $\sigma = 5$. How many percent on average of the produced resistors are in each package, and how many are discarded. Instead of a lookup table you can use the matlab function normcdf(). Use the doc in matlab to find out arguments in the function.
2. Make a matlab simulation that simulate 1000 resistors, and confirm the result obtained in question 1. Use matlab's randn() function.
3. What should the standard deviation be if the packages of 5% resistors contains half of the resistors? Find the result with the function norminv().
4. Sample 1000 resistors, with the found standard deviation, plot the pdf and cdf with a hist() function in matlab.
5. Find the mean and standard deviation of the 1000 samples, use the mean() and var() functions in matlab.
6. Why are the found mean and standard deviation not exact?