1. For the Motor Design problem introduced in class, compute the probably of meeting a requirement that weight < 22 kgs using Monte Carlo. Use the following uncertain parameters:

D N(7.5,0.5)
L N(9.5,0.5)
ρ_{cu} $N(8.94e3, 100)$
ρ_{fe} $N(7.98e3, 100)$

Using 100,000 samples I got a probability of 0.99016 (see attached code).

2. Repeat problem 1 using Monte Carlo but use the following distributions for uncertainty

D Uniform(6.5, 8.5)
L Uniform (8.5, 10.5)
ρ_{cu} $Uniform(8840, 9040)$
ρ_{fe} $Uniform(7880, 8080)$

Using 100,000 samples I got a probability of 0.99023 (see attached code).

3. Repeat problem 1 but use the Mean-value First-order second moment (MVFOSM) method. Again the uncertainties are (the variables are independent, i.e. 0 correlation):

D N(7.5,0.5)
L N(9.5,0.5)
ρ_{cu} $N(8.94e3, 100)$
ρ_{fe} $N(7.98e3, 100)$

Using 100,000 samples I got a probability of 0.6065 (see attached code).

4. Repeat problem 3 but use the following correlation matrix:

$$\begin{bmatrix} 1 & .2 & .3 & .7 \\ .2 & 1 & .5 & .6 \\ .3 & .5 & 1 & .2 \\ .7 & .6 & .2 & 1 \end{bmatrix}$$

How does the correlation change the solution?

Using 100,000 samples I got a probability of 0.6053. The correlation between these variables created a 0.0012 decrease in probability of meeting the design constraint.