

**HW 2**

**Assigned: 4/17/2020**

**Due: 4/27/2020 (on CANVAS)**

1. For the Motor Design problem introduced in class, compute the probability of meeting a requirement that weight < 22 kgs using **Monte Carlo**. Use the following uncertain parameters:
  - $D \sim N(7.5, 0.5)$
  - $L \sim N(9.5, 0.5)$
  - $dcu \sim N(8.94e3, 100)$
  - $dfe \sim N(7.98e3, 100)$
2. Repeat problem 1 using **Monte Carlo** but use the following distributions for uncertainty:
  - $D \sim \text{Uniform}(6.5, 8.5)$
  - $L \sim \text{Uniform}(8.5, 10.5)$
  - $dcu \sim \text{Uniform}(8840, 9040)$
  - $dfe \sim \text{Uniform}(7880, 8080)$
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):
  - $D \sim N(7.5, 0.5)$
  - $L \sim N(9.5, 0.5)$
  - $dcu \sim N(8.94e3, 100)$
  - $dfe \sim N(7.98e3, 100)$
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?