ME 615: Design Under Uncertainty

Prof Hoyle, Spring 2020

HW 1

Assigned: 4/1/2020

Due: 4/15/2020

1. Find the following **mean** and **standard deviations** for the following distributions:
   - A lognormal distribution, in which the associated normal distribution has μ=5 and σ =1.25.
   - A beta distribution in which the shape parameters are α = 2 and β = 5.
   - A uniform distribution defined over the range a = 1 and b = 8.
2. Using the data in the zip file: data.xlsx
   - Create a normal probability plot.
   - Create a lognormal probability plot.
   - Create an extreme value probability plot
   - *Which distribution looks to be the best fit*?
3. The maximum daily temperature in Phoenix AZ in June is known to vary between 80°F and 110°F. The distribution of maximum daily temperature is modeled using a beta distribution with parameters α = 2 and β = 3.
   - What is the probability that the daily maximum temperature will **exceed** 100°F? (*hint*: you will need to scale your data, and use Matlab or similar to compute the CDF)
   - Redo the problem above (Pr{T > 100°F}), but now assume that the temperature is normally distributed with a mean of 95°F and std dev of 10°F.
4. The maximum temperature in Phoenix AZ in June is modeled as a normal distribution with mean of 95°F and std dev of 10°F, while the maximum humidity in June is modeled as a normal distribution with mean of 21% and std dev of 5%. Temperature and Humidity are positively correlated, with a covariance of 4.
   - What is the probability that the daily maximum temperature will be **less than** 99°F and the humidity will be **less than** 23%. (*hint*: you will need to use the Matlab function **`mvncdf`**)
   - Redo the problem above, but now assume the two entities are **uncorrelated**.