# ENRE 447 Homework 4

Problems are similar to the book problems from Modarres & Groth 2023 (problem number in brackets). In some cases I have modified the problem slightly. Approved software ok, open everything. All policies of course syllabus and grading rubric apply.

1. Nine light bulbs are observed, and the exact failure time of each is recorded as 70, 150, 250, 360, 485, 650, 855, 1130, and 1540. Estimate the cdf and pdf of failure times, the reliability function, and the hazard-rate function. Plot these functions with time.

2. [5.6] The following time to failure data are found when 158 transformer units are put under test. Use a nonparametric method to estimate f(t), h(t), and R(t) of the transformers. No failures are observed prior to 1,750 hours.

| Time Interval | | Number |
|---|---|---|
| 1,750 | 2,250 | 17 |
| 2,250 | 2,750 | 54 |
| 2,750 | 3,250 | 27 |
| 3,250 | 3,750 | 17 |
| 3,750 | 4,250 | 19 |
| 4,250 | 4,750 | 24 |

3. [5.18] Time to failure data from eight devices placed on an accelerated test is shown below.

| i | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Time to failure | 65 | 85 | 90 | 95 | 340 | 405 | 555 | 575 |

   a. Use probability plotting to estimate the parameter of the exponential distribution.
   b. Discuss the suitability of the exponential distribution for this data.

4. [5.22a] In an accelerated test, failures of 8 units are recorded after 8, 17, 21, 21, 22, 39, 42, and 47 days after starting in operation. The other two units are operating after 50 days.
   a. Perform a Weibull probability plot of these data.
   b. Find the parameters of the Weibull distribution from the plot.