Statistics 251: Lab 4 Exercises

Part 1: Maximum

System I consists of three components connected in parallel (see Figure 1). The lifetimes (in hours) of the components independently follow an exponential distribution with mean 80.

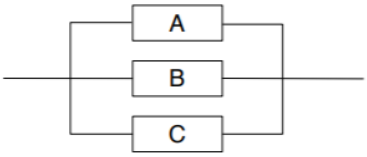

Figure 1: Structure of System I.

1. Calculate the cdf and pdf of the lifetime of System I. Does the lifetime of System I follow an exponential distribution?
2. What is the probability that the system fails before 70 hours based on your cdf in Question 1?
3. Generate a random sample of size 10,000 for the lifetime of System I.
    - i) Draw a histogram representing the probability density of the sample. On top of the histogram, draw the pdf calculated in Question 1. Does the probability density of the sample follow similar pattern as the pdf?
    - ii) Estimate the probability that the system fails before 70 hours using the sampled data. Is the result close to the true probability value?

Part 2: Minimum

In System II, components A, B, and C are connected in series (see Figure 2). The lifetime of each component follows the same distribution as in Part 1.

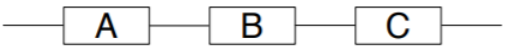

Figure 2: Structure of System II.

Answer Questions 1-3 above for System II.