

ECE 341 - Homework #7

Uniform and Exponential Distributions. Summer 2024

Uniform Distributions

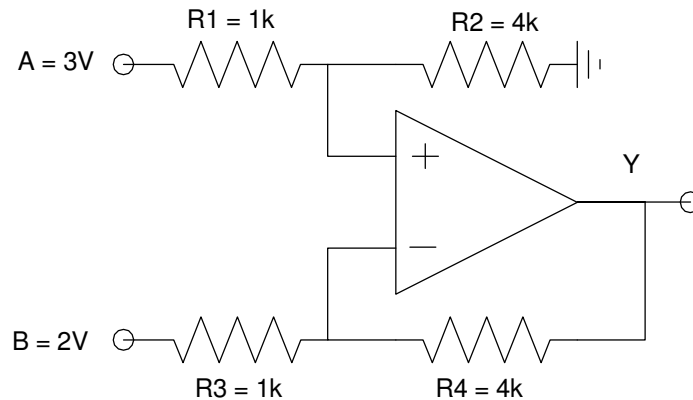
Let

- \mathbf{a} be a sample from A, a uniform distribution over the range of (1, 3)
- \mathbf{b} be a sample from B, a uniform distribution over the range of (1, 4)

- 1) Determine the pdf for $\mathbf{a} + \mathbf{b}$ using moment generating functions (i.e. LaPlace transforms)
- 2) Determine the pdf for $\mathbf{a} + \mathbf{b}$ using convolution (by hand or Matlab)

3) Assume each resistor has a tolerance of 5% (i.e. a uniform distribution over the range of (0.95, 1.05) of the nominal value. For the following circuit, determine

- The voltage at Y as a function of $\{R1, R2, R3, \text{ and } R4\}$, and
- The mean and standard deviation for the voltage at Y using a Monte Carlo simulation.



Queueing Theory

Assume you are running a fast-food restaurant.

- The time between customers arriving at a restaurant is an exponential distribution with a mean of 60 seconds.
 - The time it takes to serve each customer is an exponential distribution with a mean of 30 seconds.
- 4) Run a single Monte-Carlo simulation for this restaurant over the span of one hour.
 - Give the formula for each column in your simulation
 - What is the longest waiting time for a customer in your simulation?
 - What is the largest queue over the span of one hour?