CE 311S: Exam 1

Friday, March 8

9:00 – 9:50 AM

Name _____

Instructions:

- **SHOW ALL WORK** unless instructed otherwise. No shown work means no partial credit!
- If you require additional space, you may use the back of each sheet and/or staple additional pages to the end of the exam.
- If you need to make any additional assumptions, state them clearly.
- You may use a calculator and one regular-sized sheet of notes. No additional resources are permitted.
- The number of points associated with each part of each problem is indicated.

Problem	Points	Possible
1		30
2		40
3		30
TOTAL		100

Problem 1. (30 points). FunWorld is a local amusement park. Though strictly low-budget, it is a popular location. FunWorld tries to make money any way they can, so the food they sell is of suspiciously low quality. Of those who ride FunWorlds signature ride, the *Spinning Wheels of Death*, 60% of riders become ill. Of those who become ill, it is found out that 70% ate a FunWorld Jumbo Chili Dog before riding the ride. Of those who do not become ill, only 40% ate a FunWorld Jumbo Chili Dog.

(a) (10) Consider one person riding the *Spinning Wheels of Death*. Calculate the probability that this person ate a FunWorld Jumbo Chili Dog beforehand.

(b) (10) If 1000 people ride the *Spinning Wheels of Death*, how many people do we expect to see eat a jumbo chili dog and ride the *Spinning Wheels of Death* without falling ill?

(c) (10) If you ate a FunWorld Jumbo Chili Dog and then ride the *Spinning Wheels of Death*, what is the probability you will fall ill?

Problem 2. (40 points). Answer each of the following questions.

(a) (10) Upon approaching the entrance to the park you trip, dropping all of your FunWorld ride passes, and must stop for 4 minutes to collect them all. Suppose your group would have been next in line, but another group of people arrives every 15 seconds on average. What is the mean and standard deviation of the number of groups that get in line before you?

(b) (10) When you finally arrive at FunWorld, there are 30 people that walk in about the same time as you. Whenever someone arrives, there is a 0.2 probability that they will be hugged by one of the FunWorld mascot characters, Pauli the Opossum (regardless of their disinclination towards being hugged by large rat-like park creatures). What is the mean and variance of the number of those people entering FunWorld who will be hugged by a Pauli?

(c) (10) While the FunWorld Jumbo Chili Dog is never exactly good for someone, on the day you are at the park a batch of particularly bad hot dogs are mixed into the normal supply. There are 10 total hot dogs at the northern park stand, 4 of which are particularly bad. If 7 people purchase a FunWorld Jumbo Chili Dog from the northern stand, what is the probability that two of them get particularly bad chili dogs?

(d) (10) In fact, the northern park stand keeps its chili dogs at a temperature T that can be described by the density function $f_T(t) = \frac{2}{50^2}(t - 100)$ for $t \in [100, 150]$, and zero otherwise. (T is measured in degrees Fahrenheit). The safe temperature for chili dogs is 140 degrees or higher. What is the expected temperature that the chili dogs are kept at? What is the probability they are kept at an unsafe temperature?

Problem 3. (30 points). You are waiting in line for the *Spinning Wheels of Death* with two friends, when the ride malfunctions and a piece of debris comes flying towards you. All three of you manage to duck out of the way, but you drop your FunWorld Jumbo Chili Dogs in the process. Not wanting to waste food, you pick up the chili dogs, but you aren't sure which chili dog originally belonged to whom. Assume that each person is equally likely to get any of the three chili dogs (the selection is completely random and all outcomes are equally likely).

(a) (5) What is the probability that all of you end up with your original chili dogs?

(b) (5) What is the probability that nobody ends up with your original chili dog?

(c) (10) Among the three of you, on average how many people got their original chili dog?

(d) (10) What is the variance of the number of people who got their original chili dog?