CE 311S: Exam 1

Tuesday, October 10
11:00 AM – 12:15 PM

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		20
2		30
3		30
4		20
TOTAL		100

Problem 1. (20 points). You are enjoying your new apartment in West Campus (The Lofts at The Residences at Rio), but not your roommate whom you met on Craigslist. They leave the kitchen a mess, have questionable hygiene, and even more questionable taste in music (which they play loudly at odd hours of the night). As a result, there are several nights a week when you are unable to sleep. Thus far in the semester, the number of sleepless nights each week is:

1 7 0 4 0 5 1 6

(a) (5) What is the mean number of nights you are unable to sleep each week?

(b) (5) What is the median?

(c) (5) What is the mode?

(d) (5) What is the variance?

Problem 2. (30 points). Unfortunately your roommate's habits are starting to affect your ability to stay awake in your classes, even Dr. Boyles' CE 311S class. If you got a good night's sleep, you can always stay awake in his class. But if you only slept part of the night, you fall asleep 20% of the time, and if you got no sleep last night, you fall asleep in lecture 80% of the time. There have been 12 lectures in class so far; of these, you have had 3 nights where you slept well, 6 nights where you slept partially, and 3 nights where you did not sleep at all. Assuming your experience to date represents the true probabilities of these events, answer the following questions.

(a) (10) What is the probability that you get no sleep, but still stay awake in lecture?

(b) (10) What is the probability that you stay awake in lecture at all?

(c) (10) Assuming you fall asleep in lecture, what was the likelihood that you got no sleep last night?

Problem 3. (30 points). After what seems like an eternity, your roommate is heading home for a weekend and you can get some peace and quiet. Better yet, your good friend Riley from high school is visiting you from College Station. Riley is amiable, loyal, and an all-around good friend, but has extremely questionable taste in food, and you used to argue frequently over where to eat. Since then, you and Riley have agreed to the following procedure: each of you writes the names of several restaurants on scraps of paper; these are placed face-down, combined, shuffled, and five pieces of paper are chosen; these are the restaurants you will eat at this weekend. Here are the restaurants each of you has chosen:

Your restaurants
Titaya's Thai Cuisine
Asti
Fonda San Miguel
Fricano's Deli
East Side Pies

Riley's restaurants
Chili's at 45th & Lamar
Olive Garden
Taco Bell
Cici's Pizza

(a) (5) What is the probability that you eat at Fricano's this weekend?

(b) (10) What is the probability that you eat at exactly two of your restaurants this weekend?

(c) (10) What is the expected number of Riley's restaurants that you will eat at this weekend?

(d) (5) What is the probability that you go to more of your restaurants than Riley's restaurants? (Explain your answer, don't just give a number).

Problem 4. (20 points). Pat has gone back to College Station, and you had an enjoyable weekend but didn't get much studying done for the 311S exam. Maybe pigging out on Cici's Pizza wasn't such a great idea after all. Your only hope is to run across an albino squirrel on the way to the exam (a sign of good luck). There are several possible places on campus where albino squirrels live: the West Mall, the Turtle Pond, and the lawn in front of the EERC. Luckily, your route to ECJ passes by all of these locations, so you have three opportunities to sight an albino squirrel. At each of these three locations, assume that albino squirrels appear one at a time, and completely independent of each other, with an average rate of 1 every $(\ln(10/9))^{-1}$ days.

(a) (5) What is the probability of seeing at least one albino squirrel at any one location today?

(b) (5) What is the probability of seeing exactly two albino squirrels at any one location today?

(c) (5) What is the probability of seeing at least one albino squirrel on your entire route today?

(d) (5) Let X be the number of times you walk this route until you see an albino squirrel. What are $E[X]$ and $V[X]$?