

CE 311S: Exam 1
Thursday, March 5
2:00 – 3:15 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 one regular-sized sheet of notes; please turn in the notes with your exam. No additional resources are permitted.
- The number of points associated with each part of each problem is indicated.

Problem	Points	Possible
1		30
2		25
3		25
4		20
TOTAL		100

Problem 1. (30 points). It is the first day of spring break: you are done with midterms, tired of school, and are looking forward to a long-awaited vacation with your friends. You show up at the airport ready to catch your flight, hopeful that the trip will get off to a smooth start despite the fact that you purchased your ticket on a low-budget airline with a reputation for cutting corners at every chance. In fact, only 30% of their flights take off on time. When a flight does not take off on time, 80% of the time it is due to serious mechanical difficulties. (When a flight does take off on time, there is only a 5% chance of serious mechanical difficulties.)

- (a) (10) What is the probability that your plane will take off on time without serious mechanical difficulties?
- (b) (10) What is the probability that a plane suffers from serious mechanical difficulties?
- (c) (10) If a plane has serious mechanical difficulties, what is the probability that it will take off on time?

Problem 2. (25 points). Fortunately, your plane takes off on time. Unfortunately, it has serious mechanical difficulties. After two hours, the flight begins to shake, and the captain announces that you will have to make an emergency landing. The plane comes to a landing on a long-abandoned airstrip in the New Mexico desert, miles from any city. Without any options, you and your two friends walk to the highway and try to hitchhike to town.

- (a) (7) As you gather your luggage, you notice that the airline mixed up the bags, so there is only a 20% probability that a passenger can actually find their bag. What is the probability that one (and only one) of your party can find your bag?
- (b) (8) You notice that cars pass by at an average rate of 3 vehicles every 20 minutes. What is the expected number and standard deviation of cars which pass by in the next 40 minutes?
- (c) (7) What is the probability that at least one vehicle will arrive in the next 40 minutes?
- (d) (8) Only 20% of drivers that do pass by are willing to stop for hitchhikers. Furthermore, only 30% of vehicles have enough seats for all of your friends. Assume these probabilities are independent, what are the mean and variance of the number of cars which pass by before you can get a ride?

Problem 3. (25 points). You finally reach a town and need to find a hotel to stay. The first six hotels you find have the following nightly rates, in dollars:

66 111 120 102 60 135

- (a) (5) What is the mean hotel price?
- (b) (5) What is the median?
- (c) (5) What is the mode?
- (d) (5) What is the variance?
- (e) (5) If the three of you are dividing the price evenly, what is the variance of the amount you personally have to pay?

Problem 4. (20 points). After checking in, you need to eat dinner, and ask for directions from a local. In this town, all of the restaurants are located on two streets (Easy St. and High Rd.), each of which contains 10 restaurants. Unbeknownst to you, only 3 of the 10 restaurants on Easy St. are good, while none of the restaurants on High Rd. are good.

- (a) (10) 20% of the locals are friendly (and will thus direct you to Easy St.), while the remaining unfriendly locals will direct you to High Rd. Assuming that you walk to the street suggested by the local and randomly choose a restaurant on that street to dine at, what is the probability you end up at a good restaurant?
- (b) (10) You end up at the unappetizingly-named *Ham Palace*, which has a four-page menu. The menu has a total of four one-sided pages, each with 6 foods; the n -th page has n food items containing ham. (One on the first page, two on the second, etc.) You look at page one of the menu, flip the page with probability 0.5, and pass it to your friend on the right. That friend looks at the menu, flips the page with probability 0.5, and passes it to the third friend. The third friend repeats the same procedure and returns the menu to you. You then randomly order 3 items from the 6 on the current page. What is the probability you pick at least one dish containing ham?