EE 381 Midterm

Name, I.D. #, and Date: _____

Instructions: Mark your final answers on your Scantron form. Your responses on your Scantron form will determine your score. **No electronics other than the calculators provided.** Use the scratch paper, formula sheet, and z-tables for writing. You must return them with the test. Put your name, I.D. #, and date on them. Each problem is worth 2 points. Use the pencil provided.

Decimal answers are rounded to the ten-thousandths place or the fourth digit to the right of the decimal point unless expressed otherwise.

1.) The average weight of vegan men standing between 5 foot 9 inches and 5 foot 11 inches is 145 lbs. with a standard deviation of 5 lbs. What are the minimum and maximum weights rounded to pounds for vegan men (in this height range) in the middle 78.5%?

a.) (141 lbs., 149 lbs.) b.) (134 lbs., 156 lbs.) c.) (139 lbs., 151 lbs.) d.) (150 lbs., 170 lbs.) e.) None of these.

2.) When a convicted felon leaves prison and is on parole it can be a daunting task to find employment. Fortunately there exist farmers markets which offer employment suitable to recently paroled felons. At the Hermosa Beach farmers market 7 of the 13 farmers market employees are recently paroled felons. If the police select at random 4 employees at the Hermosa Beach farmers market what is the probability 2 of them are recently paroled felons?

a.) 0.4406 b.) 0.3381 c.) 0.3147 d.) 0.5454 e.) None of these.

3.) A ski resort losses $70,000 per season when it doesn't snow very much and makes $250,000 profit when it does snow a lot. The probability of it snowing a lot is 40%. The expectation for the profit is

a.) $58,000 b.) $292,000 c.) $72,000 d.) $42,000 e.) None of these.

4.) In 2018 in an attempt to improve the reputation of the Democratic People's Republic of Korea (DPRK) lottery tickets were sold to people around the world. The grand prize of this lottery was a weekend with Kim Jung Un. During an evening with Kim Jung Un the lottery winner was offered a meal made from one of the lobsters in Kim Jung Un's private lobster aquarium. (Which by the way are all Maine lobsters!) The average weight of the lobsters was 22 ounces and the standard deviation was 0.67 ounces. When a random lobster was taken from Kim Jung Un's aquarium what was the probability it weighed more than 23.75 ounces?

a.) 0.0154 b.) 0.9955 c.) 0.9846 d.) 0.0045 e.) None of these.

5.) In lieu of using a single resistor three resistors are wired in series. The three resistors are identical. The resistance of each is normally distributed with a mean of 6 ohms and a standard deviation of 0.3 ohms. The probability the combined resistance will exceed 19 ohms is 0.0274. How precise (i.e. what is the required value of the standard deviation) would the manufacturing process have to be make the probability less than 0.0055 that the combined resistance of the circuit would exceed 19 ohms?

a.) 0.180 ohms b.) 0.220 ohms c.) 0.227 ohms d.) 0.229 ohms e.) None of these.

6.) A medication is 75% effective against a bacterial infection. Find the probability that if 12 people take the medication. At least 1 person's infection will not improve.

a.) 96.8% b.) 25.0% c.) 99.9% d.) It cannot be determined e.) None of these

7.) An experiment has two possible outcomes: the first occurs with probability p; the second with probability p^2. What is p?

a.) 0.3820 b.) 0.5000 c.) 0.2500 d.) 0.6180 e.) None of these.

8.) Of all 3 – to – 5 year old children, 56% are enrolled in school. If a sample of 500 such children is randomly selected, find the probability that at least 250 will be enrolled in school. Hint: Use De Moivre – Laplace.

a.) 0.9970 b.) 0.0035 c.) 0.9965 d.) 0.0030 e.) None of these.

9.) The binomial random variable Y has a mean $\mu_Y = 6.75$ and a standard deviation $\sigma_Y = 2.25$. What is $P(\{Y = 10\})$?

a.) 0.0001 b.) 0.0605 c.) 0.0023 d.) 0.1025 e.) None of these.

10.) When making brown rice the amount of dry rice used can vary. Let X be the random variable (RV) denoting the original amount dry brown rice in the recipe. The RV X is uniformly distributed between $\frac{2}{15}$ and $\frac{8}{15}$ cups dry measure. The amount of chicken broth used is 5/6 of a cup liquid measure. Let the RV Y denote the amount of cooked rice in cups dry measure. The linear function between the two RV is $Y = \frac{3}{2}X + \frac{1}{2}$. What is the probability that the amount of cooked rice is at most 1 cup dry measure?

a.) 50% b.) 75% c.) 25% d.) 30% e.) None of these.

11.) An employee drives to work Monday through Friday. This employee has a favorite parking spot at work. The probability that parking spot will be open for this employee each of the 5 days is 33.3%. What is the probability that on three of the five days the parking spot is open?

a) 0.8354 b) 0.1643 c) 0.6708 d) 0.3292 e) None of these.

12) At a retail store a busy day is 90% likely to be followed by another busy day. On the other hand a slow day is 50% likely to be followed by another slow day. Construct a transition matrix with the columns labeled busy and slow and with the rows labeled in the same order. On the initial day ("day zero") the store is busy. Use the transition matrix to determine the probability the store is slow the second day ("day two").

a) 0.14 b) 0.70 c) 0.30 d) 0.86 e) None of these.

13) The average cholesterol content of a certain brand of eggs is 215 milligrams (mg) and the standard deviation is 15 milligrams. The random variable is normally distributed. For a single egg the probability that the cholesterol is between 215 mg and 220 mg is determined. For a sample of 25 eggs the probability that the cholesterol is between 215 mg and 220 mg is determined. Which has greater probability?

a) Neither because they are equal. b.) The single egg. c.) The sample of 25 eggs.

d.) It cannot be determined. e.) None of these.

14) For the Markov matrix $\begin{bmatrix} 0.8 & 0.3 \\ 0.2 & 0.7 \end{bmatrix}$ there is a steady state and the product of the final probabilities is (note columns sum to one).

a.) 0.23 b.) 0.22 c.) 0.25 d.) 0.24 e.) None of these.

15) At a courthouse every person visiting must pass through an explosives detector. The explosives detector is 90% accurate when detecting the presence of explosives on a person but suffers from a 5% false positive rate. Past studies have determined that the probability that a random person will bring explosives into the courthouse is 0.1%. If the detector indicates that a random person has concealed explosives, what is the true probability they have explosives?

a.) 0.0509 b.) 0.0177 c.) 0.0009 d.) 0.9000 e.) None of these.