King Fahd University of Petroleum and Minerals

Department of Mathematics and Statistics

Stat 319: Probability and Statistics for Engineers and Scientists
Major Exam 1 – Spring 2013 (T122)
Monday, March 4, 2013
Allowed Time: 75 minutes, from 6:00-7:15pm

Instructors: (Circle One)

W. Al-Sabah **E. Al-Sawi** **R. Anabosi** **A. Joarder**

M. Malik **M. Saleh** **W. Sharabati (coordinator)**

Name: _____ ID #: _____

Section #: _____ Serial Number: _____

Instructions:

1. **Show all your work and write clearly**. No points for answers without justification!
2. **Only basic calculators are allowed.**
3. **Turn off your cell-phone and put it away.**
4. Do not copy from or communicate with any other person, I promise myself not to cheat on this exam. Sign Here:

   _____

Question	Score	Points
1		15
2		10
3		5
4		5
5		5
6		5
7		15
Total:		60

1. Motor vehicles sold to individuals are classified as either cars or light trucks and as either US or non-US. In a recent year, 69% of vehicles sold were light trucks, 78% were US, and 55% were US light trucks. Let A be the event that a vehicle is a car and B the event that it is non-US.

   (a) Find the probability that the vehicle is a non-US car.

   (b) Given that a vehicle is non-US, what is the probability it is a light truck?

   (c) Are the events "vehicle is a light truck" and "vehicle is non-US" independent? Justify your answer.

2. A researcher receives 87 containers of oxygen. Of those containers, twenty of them have oxygen that is not ionized and the rest are ionized. Two samples are randomly selected, without replacement, from the lot.

   (a) What is the probability that the first one selected is not ionized?

   (b) What is the probability that the second one selected is not ionized given that the first one was ionized?

3. A lot, consisting of 150 fuses, is inspected by the following procedure. Five fuses are chosen at random and tested; if all 10 blow at the correct amperage, the lot is accepted. Suppose that the lot contains 15 defective fuses. If X is a random variable equal to the number of defective fuses in the sample of 10, find the probability of accepting the lot.

4. Suppose that the number of drivers traveling between Al-Khobar and Al-Dammam every 30 minutes has a Poisson distribution with $\lambda = 8$. In the long run, during what proportion of such 30-minute periods will the number of drivers be within 1 standard deviation of the mean value?

5. A manufacturer knows that on the average 20% of the electric toasters which he makes will require repairs within 1 year after they are sold. When the toasters are selected one by one, what is the probability that the first toaster, that required repairs within 1 year, is the 5^{th} one?

6. In a salad bar, customers are charged for the amount of salad they take. Sampling suggests that the amount of salad taken is uniformly distributed between 150 grams and 450 grams. What is the probability that a customer will take between 0 and 250 grams of salad? Find the expected value of the salad plate filling weight.

7. An electronics company manufactures resistors that have a mean resistance of 100 ohms and a standard deviation of 10 ohms. The distribution of resistance is normal.

   (a) Find the probability that a resistor will have a resistance between 105 and 125 ohms. Suppose these resistors are considered high power resistors and used in snubbers.

   (b) Report the resistance of the top 15% of all resistors.

   (c) If 10 resistors are selected at random, what is the probability that at most 7 resistors are not high power resistors?

Good Luck! ☺