MA 222 EXAM #4 April 28, 2016

Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

I pledge my honor that I have abided by the Stevens Honor System.

signature: ­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Closed book, closed notes. No electronic access. Answer all questions.**

1. Define, for statistical hypothesis testing :

a) a statistical hypothesis

b) Test statistic

c) Critical (rejection) region

d) Type I error

e) Type II error

f) the significance level of a Hypothesis Test

2. Fuel consumption ( in miles per gallon) for long-distance truck drivers is assumed to be normally distributed. A study was done with 24 drivers of trucks of a particular model, yielding an average miles per gallon of 18.68 and a sample standard deviation of 1.7 miles per gallon. What is the 90% interval estimate for the population average fuel consumption?

3. In an upcoming election it is desired to take a random sample of voters to estimate the probability that Candidate A will win. How many voters must be sampled to be 98% sure that our estimate will be within one percentage point of the true value?

4. A random sample of 270 homes was taken from a large population of older homes to estimate the proportion of homes with unsafe wiring. If, in fact, 20% of the homes have unsafe wiring, what is the probability that the sample proportion of homes with unsafe wiring will be between 16% and 24%?

5. The length of metal rods produced by an industrial process are known to be normally distributed with a standard deviation of 1.8 millimeters. We wish to estimate the mean length of rods. How many rods do we need to sample so that our estimate of the mean is within 0.5 millimeters with probability 99%?

6. Today’s newspaper reports that they polled a random sample of 1500 voters and found that in an upcoming election 53% of the voters preferred Candidate A with a “margin of error” of ± 2 percentage points.

What confidence level is implied by this statement?

7. A production line is evaluating a new machine for their manufacturing process, but they only plan to purchase the new machine if it shows a significant increase in production level. The present process has a mean production rate of 80 units per hour with a population standard deviation of σ =8 units.

A random sample of 25 production hours with the new machine yields an average production rate of 83 units per hour.

a) At a 5% significance level, does this sample imply that the company should purchase the new machine?

b) What is the critical region for this test in terms of the sample average?