Stat 254 Assignment Two

Name:_____

Assignments must be completed on this paper. Marks may be deducted for not showing all your work.

1. [4 marks] Consider the random variable X with the following probability density function: $f(x) = \frac{1}{(7 \ln 2)x}$ for $4 \leq x \leq 512$ and $f(x) = 0$ otherwise.

a) Find the expected value of X. Give an exact value.

b) Find $P(50 \leq X \leq 80)$. Round your answer to two decimal places.

2. [4 marks] The diameters of ball bearings at a manufacturing plant are normally distributed with mean μ and SD σ. Over a long period of time it is observed that 25.46% of ball bearings have diameters more than 9.96 mm, and 7.78% of ball bearings have diameters more than 10.05 mm. Find μ and σ. Round your values to one decimal place.

3. [4 marks] Each shipment ordered from a retail website has a 12% probability of being delayed. Estimate the probability of between 90 and 110 delays (inclusive) among 850 shipments.

4. [3 marks] As part of their job interview process, 900 aspiring engineers write a standardized test which is scored out of 100. The mean test score is 71 with a variance of 25. A random sample of 60 tests is selected. Find the probability that the mean of the sampled test scores is less than 72.

5. [3 marks] A website tracks how long visitors stay on the site. A sample of 82 visitors stayed for an average of 1.33 minutes, with a standard deviation of 0.49 minutes. Find a 95% upper confidence bound for the average amount of time visitors stay on the site. Round your answer to two decimal places.

6. [7 marks] Test whether the population proportions p_1 and p_2 are equal at the 1% significance level given the following sample data:
$n_1 = 200, \hat{p}_1 = 0.81, n_2 = 400, \hat{p}_2 = 0.78.$

a) State H_0 and H_a

b) Check any necessary assumptions.

c) Do you reject H_0? Show all your work.

d) Find the p-value.

7. [5 marks] Find the probability of making a Type II error in the hypothesis test below if the true value of μ is 11.1.

Test H_0: $\mu = 10.00$ at $\alpha = 0.05$ with $\overline{x} = 10.6, s = 1.8, n = 60$.