SHOW WORK TO GET FULL CREDIT

Fall 2014 December 17, 2014
MATH-333 (Common Final Exam) NJIT

Q. # 1	#2	#3	#4	#5	#6	#7	#8	Total
12	12	14	14	14	12	12	10	100

This is a closed book exam. Non-programmable calculator is allowed. Formula sheet and tables are provided.

Name (PRINT) _____ Section # _____
Last First

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Problem 1) (Note that a) and b) are separate problems)

a) The lifetime of a mechanical assembly in a vibration test is exponentially distributed with a mean of 500 hours. If an assembly has been on test for 500 hours without a failure, what is the probability of a failure in the next 100 hours? (Round your answer to 4 decimal places) (6 points)

b) A metabolic defect occurs in approximately 5% of the infants born at a hospital. Six infants born at the hospital are selected at random. What is the probability that exactly two have the metabolic defect? (Round your answer to 4 decimal places) (6 points)

Problem 2) (Note that a) and b) are separate problems)

a) Suppose that a certain random variable, X, has the following cumulative distribution function (cdf):

$$F(x) = \begin{cases} 0 & x < 2 \\ 0.25x^2 - x + 1 & 2 \le x \le 4 \\ 1 & 4 < x \end{cases}$$

Find P(X > 2.5) (Round your answer to 4 decimal places) (6 points)

c) A soft drink dispensing machine is said to be out of control if the variance of the contents exceeds 1.15 deciliters. A random sample of 25 drinks from this machine is studied and the sample variance is computed to be 2.03 deciliters. Assume that the contents are approximately normally distributed. Construct a 90% lower confidence bound on σ^2. (Round your answer to 2 decimal places) (6 points)

Problem 3) The life length of light bulbs manufactured by a company is normally distributed with a mean of 1000 hours and a standard deviation of 200 hours.

a) What life length in hours is exceeded by 97.5% of the light bulbs? (7 points)

b) What is the probability that the average life length of a random sample of 36 light bulbs will exceed 1005 hours? (Round your answer to 4 decimal places) (7 points)

Problem 4) A civil engineer is analyzing the compressive strength of concrete. Compressive strength is normally distributed with $\sigma = 31.62$ psi. A random sample of 36 specimens has a mean compressive strength of 3250 psi.

a) Construct a 95% two-sided confidence interval on the mean compressive strength. (Round your answer to 3 decimal places) (7 points)

b) Suppose that it is desired to estimate the compressive strength with an error of less than 15 psi at 99% confidence. $\sigma = 31.62$ psi. What sample size is required? (7 points)

Problem 5) (Note that a) and b) are separate problems)

a) An Izod impact test was performed on 16 specimens of a PVC pipe. The sample mean is 1.25 and the sample standard deviation is 0.25. Construct a 99% confidence interval on the Izod impact strength. (Round your answer to 3 decimal places) (7 points)

b) Of 1000 randomly selected cases of lung cancer, 823 resulted in death within ten years. Using the point estimate of p obtained from the preliminary sample, what sample size is needed to be 95% confident that the error in estimating the true value of p is less than 0.03? (7 points)

Problem 6) (Note that a) and b) are separate problems)

a) As items come to the end of a production line, an inspector chooses items to undergo a complete inspection. Of all items produced, 10% are defective and the remaining good. Sixty percent of all defective items go through a complete inspection, and 20% of all good items go through a complete inspection. Given that an item is completely inspected, what is the probability that it is defective? (6 points)

b) The following table displays the number of defective and non-defective medical devices produced by three manufacturing companies.

	Company A (A)	Company B (B)	Company C (C)	Total
Non-defective (N)	18	7	19	
Defective (D)	2	3	1	
				50

Two medical devices are randomly selected without replacement. Find the probability that at least one of them is defective (D). (Round your answer to 3 decimal places) (6 points)

Problem 7) A manufacturer claims that the average lifetime of cameras is more than 84 months. Assume that the life time of cameras is approximately normally distributed, with a standard deviation $\sigma = 10$ months. A random sample of 100 cameras has an average lifetime of 85.1 months.

a) State the null and the alternative hypotheses. Is there evidence to support the claim that average lifetime of cameras is more than 84 months? Use $\alpha = 0.01$. (6 points)

b) What is the Type II Error (β) for the test in part a) if the true mean is 86 months? (Round your answer to 4 decimal places) (6 points)

Problem 8) Seven individuals have participated in a diet modification program to stimulate weight loss. Their weights (in pounds) before and after the program are shown below. You may assume that the weights follow a normal distribution.

Subject	1	2	3	4	5	6	7
Before	195	213	247	201	187	246	312
After	187	195	221	190	175	221	285

State the null and the alternative hypotheses for testing the claim that there is a mean reduction in weight. Is there evidence to support the claim? Test using $\alpha = 0.05$ (10 points)

Extra Space (ANY “Rough Work” must be crossed out)