Name_____StudentID_____

Prince of Songkla University
Department of Industrial Engineering, Faculty of Engineering

Midterm Examination: Semester 2	Academic Year: 2003
Date: 23 December 2003	Time: 9.00 -12.00 PM
Subject 225-241 Engineering Statistics I	Room: R300

Instructions: Read them carefully

1. All materials are allowed.
2. There are 6 problems, and work all of them. Also show your work clearly and legibly.
3. Answer your questions in this test paper, only.
4. You must write your name and your student ID in every page of the test.
5. Total score is 100 points.

Distribution of Scores

Problem	Points	(a)	(b)	(c)
1	20	6	14	
2	15	5	5	5
3	20	13	7	
4	15	5	5	5
5	15	4	4	7
6	15	5	10	

Tests are prepared by
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Problem 1: (20 points)   Do the following problems.

a) Suppose 2% of cotton fabric rolls and 3% of nylon fabric rolls contain defects. Of the rolls used by a manufacturer, 70% are cotton and 30% are nylon. What is the probability that a randomly selected roll used by the manufacturer contains defects?

b) An inspector who is working for a manufacturing company has a 99% chance of correctly identifying defective items and a 0.5% chance of incorrectly identifying a good item as defective. The company has evidence that its production line produces 0.9% of defective items. If an item selected at random is identified as non-defective, what is the probability that it is non-defective?

Problem 2: (5 points) X is a continuous random variable represented the current measured in a thin copper wire in milliamperes, (mA). Assume that the range of X is [1,3 mA], and assume the probability distribution function of X is $f(x) = 0.05 x^{-1}$ for $1 \le x \le 3$.

a) What is the probability that a current measurement is less than 2 mA?

b) What is the mean of of random variable X?

c) What is the variance of random variable X?

Problem 3: (20 points) A small business website contains 10 pages and 60%, 30%, and 10% of the pages contain low, moderate, and high graphic content, respectively. A sample of four pages is selected without replacement. Let random variable X represent the number of pages with moderate graphic content and random variable Y represent the number of pages with high graphic content in the sample. Determine

a) $f(x, y)$

b) $f(y \mid x = 3)$

Problem 4: (5 points) Do the following problems.

a) An electronic measurement in an automated filling operation stops the production line after three underweight packages are detected. Suppose that the probability of an underweight package is 0.001 and each fill is independent. What is the mean number of fills before the line is stopped?

b) Four bolts are randomly selected without replacement from a box that contains 90 bolts from one supplier and 20 bolts from another supplier. What is the probability that exactly 3 bolts are from the same supplier?

c) The number of failures of a machine in the factory fails with a mean of 0.02 failure per hour. What is the probability that this machine does not fail in an 8-hour shift?

Problem 5: (5 points) The width of a tool is assumed to be normally distributed with a mean of 0.5 micrometer and a standard deviation of 0.05 micrometer.

a) What is the probability that a width is between 0.47 and 0.63 micrometer?

b) What is the probability that a width is greater than 0.62 micrometer?

c) Determine the values of width that are symmetric about the mean that include 89.9% of samples.

Problem 6: (5 points) Do the following problems.

a) The lifetime of a mechanical assembly in a vibration test is distributed with a mean of 400 hours. What is the probability that an assembly operates for more than 50 hours before failure?

b) Suppose the random variables, X_1 is the length and X_2 is the width of a manufactured part. Assume $E(X_1) = 2$ centimeters with standard deviation 01 centimeter and $E(X_2) = 5$ centimeters with standard deviation 02 centimeter. Also assume that X_1 and X_2 are independent. Determine the probability that the perimeter exceeds 14.5 centimeters.