MATH 333: Probability & Statistics   **FINAL EXAM**   **(Spring 2003)**

May 14, 2003 (B)   NJIT

Name:	SSN:	Section #

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⟶ **Must show all work to receive full credit.**
I pledge my honor that I have abided by the Honor System. _____
(Signature)

Scores	
#1	
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1. A box contains 10 light bulbs of various wattages: 4 are 50 watt, 4 are 75 watt and 2 are 100 watt bulbs.

   (a) What is the probability of drawing exactly one 50 watt bulb and one 100 watt bulb if 2 bulbs are randomly selected without replacement? (5 pts)

   (b) What is the probability that the 2 bulbs drawn at random will have the same wattage? (5 pts)

2. A system consists of components 1, 2, and 3 configured as:

1

3

2
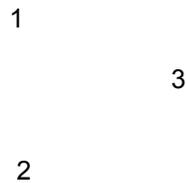
and, having probability of failure 0.2, 0.3, and 0.1 respectively. Assuming the components fail independently of each other, what is the probability that the system fails? (10 pts)

3. A manufacturing plant receives a shipment of 10 hard drives to manufacture laptop PC's. It is known that the defect rate is 2.0%.

    (a) Calculate the probability that all 10 hard drives will function properly. (5 pts)

    (b) Calculate the probability that all but one will function properly. (3 pts)

    (c) Calculate the probability that two or more will not function properly. (2 pts)

4. Let X be the number of accidents on Garden State Parkway on a single day. Assume that X follows a Poisson distribution with a mean of 2.

    (a) What is the probability that there are no accidents in the whole day? (4 pts)

    (b) What is the probability that there are no accidents on two consecutive days? (3 pts)

    (c) What is the probability that there are at least 2 accidents on a single day? (3 pts)

5. The life span of a component is exponentially distributed with a mean of 15 hours.
   (a) What is the probability that the component will last at most 10 hours? (4 pts)

   (b) At least 10 hours? (2 pts)

   (c) What is the median time? (4 pts)

   (d) Given that component has lasted 10 hours what is the probability that it will last a total of 20 hours? (2 pts)

6. An anthropologist measured the height (in inches) of a random sample of twenty-five men in a certain tribe, and she found that the sample mean was 76.4 and the sample standard deviation was 2.3 Determine the 95% confidence interval of the average height of all men in the tribe. You can assume that height is normally distributed. (10 pts)

7. For a project, a student asks a random sample of ten fellow students to keep track of how much they spend on laundry in a month. Here are data, in dollars:

17	13.5	20.5	24	24.75
27.25	9.5	18.25	24.5	14.5

The sum of these data is 193.75, and the sum of their squares is 4056.44.

    (a) Determine a 95% confidence interval for the variance of the monthly laundry expenses. (8 pts)

    (b) At the 10% significance level, test the (null) hypothesis that, on average, students spend at most $16 a month on laundry. (8 pts)

8. Let $X_1,...,X_n$ be a simple random sample of size n from a population with mean μ and standard deviation σ. Let $Y = X_1+X_2+...+X_n$. Calculate the mean and variance of Y. (10 pts)

9. The battery charge of laptops from two companies is compared. The result is that a simple random sample of 60 laptops from one company lasts, on the average, 2.56 hours with a sample standard deviation of 0.4 hours. While a simple random sample of 50 laptops from the other company lasts on the average 2.65 hours with a sample standard deviation of 0.3 hours.

    (a) Calculate a 90% confidence interval for the difference between the means. (6 pts)

    (b) At the 10% significance level test the null hypotheses that the two means are equal against the alternative that they are different. (6 pts)