MATH 333: Probability & Statistics. Exam II,   **Spring 2002**   Scores

April 17, 2002   **NJIT**

#1	
# 2	
#3	
#4	
#5	
#6	
Total	

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)

1. In a noisy communication channel, there is a 1% chance that each transmitted bit (0 or 1) will be corrupted. If a message of 1000 bits is transmitted, what is the approximate probability that:

    (a) **(7 points)** no more than 8 bits will be corrupted?

    (b) **(9 points)** exactly 15 bits will be corrupted?

2. Assume that the time (in **hours**) it takes to repair an electrical breakdown, is a continuous random variable X with probability density function,

$$f(x) = \begin{cases} 2x, & \text{if } 0 < x < 1 \\ 0, & \text{otherwise.} \end{cases}$$

(a) **(4 points)** Find the expected repair time, in **minutes**.

(b) **(8 points)** Find the standard deviation of the repair time, *rounded to the nearest **minute***.

(c) **(7 points)** If the cost incurred in a repair which takes X (hours) is $8X^3 + 50$ dollars ($), find the expected repair cost.

3. (a) & (b) The number of fish caught by a fisherman is Poisson distributed with mean three per hour. Suppose, he starts fishing at 9 a.m., find the probability that the number of fish caught by him is:
(a) **(8 points)** at least one, by 9:30 a.m.,

3. (b) **(6 points)** exactly three, by 11:00 a.m.

4. The time it takes a bank clerk to process a check deposit has an exponential distribution with mean 40 seconds.
   (a) **(8 points)** Compute the probability that a check deposit takes less than 30 seconds.

   (b) **(8 points)** What is the median of this distribution?

5. (a) & (b) The mean GPA of engineering majors at a large university is 3.25, with a standard deviation of 0.88. Assume that any class of students represents a random sample from this university. In a class of 64 students, find the probability that the average GPA is:
   (a) **(8 points)** between 3.1 and 3.22,

5. (b) **(7 points)** more than 3.5.

6. A researcher is interested in estimating the true average bonding strength (measured in suitable units) of a certain brand of an adhesive applied to two particular types of surfaces.

   (a) **(10 points)** What sample size is necessary in order for the sample mean bonding strength to be within 8 of the true mean, with 95% confidence? The population standard deviation of the bonding strength is known to be 40.

   (b) **(10 points)** One hundred values of these bonding strengths resulted in a sample mean and standard deviation of 255.6 and 26.84, respectively. Calculate the 92% confidence interval for the true mean bonding strength.