EMIS 7300 (NTU SYS 521): Systems Analysis Methods Professor: Eli Olinick

Instructions for the site coordinator:

- 1. The student has 80 minutes to complete this exam.
- 2. The exam may be taken on any date between (and including) October 25, 2004 and November 02, 2004.
- 3. The completed exam must be returned via fax (214 768 1112) to Professor Olinick at SMU by 5:00 P.M. (Dallas Time) November 02, 2004. Before faxing the exam please check both sides of each page of the original to see if the student has done in any work on the back side of any of the exam pages. If this is the case, please send both sides of the page.
- 4. Students are free to refer to their textbook (Quantitative Analysis for Management, by Render, Stair, and Hanna, Eighth Edition) and notes, and may use hand-held, electronic calculators during this exam. Students may **not** use laptop computers for this exam.
- 5. Please keep the student's original exam until December 15, 2004 in case there are problems with the fax transmission.
- 6. Please complete and sign the following form before returning the exam to Professor Olinick:

STUDENT'S NAME:	
Exam Date:	
TIME STARTED:	
TIME FINISHED:	

I certify that the above information is correct. I have proctored this exam taken by the above named student and verified that the academic integrity of this examination was not compromised.

SIGNATURE: ____

DATE:

- You have eighty (80) minutes to complete this exam.
- You may refer to your book and notes.
- You may use a hand-held calculator, or the calculator application on a PDA or palm computer, to do basic arithmetic. Any other type of electronic computation is **not** allowed.
- Present your work in an organized and <u>neat</u> fashion.
- Clearly state and explain your assumptions (if any), statements, and arguments. Your grade will be significantly affected by the clarity of your answers.
- To receive full credit, you must explain your answers and show all your work.

Problem	1	2	3	Total
Possible Score	10	10	10	30
Your score				

Last Name:

FIRST NAME:	
	_

Problem 1

(10 pts) Myrtle Air Express has decided to offer direct service from Cleveland to Myrtle Beach. Management must decide between full-price service using the company's new fleet of jet aircraft and discount service using smaller capacity commuter planes. It is clear that the best choice depends on the market reaction to the service Myrtle Air offers. Management had developed estimates of the contribution for each type of service based upon two levels of demand for service to Myrtle Beach: strong and weak. The following table shows the estimated quarterly profits in \$1000s.

	Demand for	Service
Service	Strong	Weak
Full Price	960	-490
Discount	670	320

- (a) If nothing is known about the probabilities of the chance outcomes, what is the recommended decision using the *maximax* criterion?
- (b) If nothing is known about the probabilities of the chance outcomes, what is the recommended decision using the *maximin* criterion?
- (c) If nothing is known about the probabilities of the chance outcomes, what is the recommended decision using the *minimax regret* criterion?
- (d) Suppose that the management of Myrtle Air Express believes that the probability of strong demand is 0.7 and the probability of weak demand is 0.3. Use the expected monetary value (EMV) criterion to determine an optimal decision.
- (e) Suppose that the management of Myrtle Air Express believes that the probability of strong demand is 0.8 and the probability of weak demand is 0.2. Use the expected monetary value (EMV) criterion to determine an optimal decision.

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	Demand f	or Service
Service	Strong	Weak
Full Price	960	-490
Discount	670	320

Problem 2

(10 pts.) A Social Security Number (SSN) consists of nine digits, commonly written as three fields separated by hyphens: $A_1A_2A_3$ - G_1G_2 - $S_1S_2S_3S_4$. The first three-digit field is called the "area number". The central, two-digit field is called the "group number". The final, four-digit field is called the "serial number". Assuming that any nine-digit string could be a valid SSN.

- (a) Find the probability that a randomly generated SSN contains exactly two 4's in the "area number".
- (b) Find the probability that a randomly generated SSN contains exactly one 3 in the "group number".
- (c) Find the probability that a randomly generated SSN contains exactly one digit larger than 4 in each field.

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Problem 3

(10 pts.) A cylindrical part is required to have a diameter of at least 0.90 centimeters (cm) and at most 1.03 cm. These parts are produced by a machining process that is know to produce parts whose diameters follow a normal distribution with mean 1 cm and standard deviation of 0.1 cm.

- (a) Determine the percentage of parts produced by this process that will meet the specifications.
- (b) Another machining process outputs rods with diameters that follow a normal distribution with a mean of 0.99 cm and standard deviation of 0.1 cm. What is the probability that a randomly select rod produced from this process will fit inside a randomly selected cylinder produced by the first process? That is, what is the probability that a randomly selected cylinder from the first process will have a larger diameter than a randomly selected rod from the second process?

Hint: The difference between a normal random variable X_1 with mean μ_1 and standard deviation σ_1 and a normal random variable X_2 with mean μ_2 and standard deviation σ_2 is a normal random variable, X_3 , with mean $\mu_3 = \mu_1 - \mu_2$ and standard deviation $\sigma_3 = \sqrt{\sigma_1^2 + \sigma_2^2}$.

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Cylinder process: mean of 1 cm and standard deviation of 0.1 cm.

Rod process: mean of 0.99 cm and standard deviation of 0.1 cm

Hint: The difference between a normal random variable X_1 with mean μ_1 and standard deviation σ_1 and a normal random variable X_2 with mean μ_2 and standard deviation σ_2 is a normal random variable, X_3 , with mean $\mu_3 = \mu_1 - \mu_2$ and standard deviation $\sigma_3 = \sqrt{\sigma_1^2 + \sigma_2^2}$.