Business 7120/7126: Management Decision Making
Fall 2015: Final Exam

Name: _____

Instructions: You have 2.5 hours to complete this exam. Can u. This exam is closed book and closed notes. Be brief, and precise when providing answers to problems requiring written explanation. Turn in the entire exam when finished. No smart phones allowed. There are a total of 15 questions.

1. (8 pts.) The number of cans of soft drinks sold in a machine each week is recorded below. Develop forecasts starting in period 3 using a two-period moving average.

Period	Sales	Moving average	Absolute Error	Squared Error	
1	338	----------------	---------	---------	
2	219	----------------	---------	---------	
3	278				
4	265				
5	314				
6	323				

2. (8 pts.) Using the data above, develop forecasts, starting in period 3 using the exponential smoothing approach. Assume alpha to be 0.20. Note: $F_{t+1} = \alpha Y_t + (1-\alpha) F_t$

Period	Sales	Exponential Smoothing	Abs. Error	Squared Error	
1	338	-------------------	--------	---------	
2	219	338	--------	---------	
3	278				
4	265				
5	314				
6	323				

3. (4 pts.) Using the MSE as the evaluation method, which forecasting method is the most accurate, the moving average forecast or the exponential smoothing forecast? Explain.

4. (8 pts.) The number of cans of soft drinks sold in a machine each week is recorded below. Develop forecasts starting in period 4 using Holt's Double Exponential Method. Assume that alpha is 0.2 and Beta is 0.10.

$$F_{t+1} = L_t + b_t$$

$$L_t = \alpha Y_t + (1-\alpha)(L_{t-1} + b_{t-1})$$

$$b_t = \beta(L_t - L_{t-1}) + (1 - \beta)b_{t-1}$$

Period	Sales (Y)	L	b	F
1	250	250	15	
2	265	265	15	265
3	278	279.6	15	280
4	265			
5	314			
6	323	-	-	

5. (10 pts.) Quarterly billing for water usage is shown below.

Quarter	Year 1	2	3	4
Winter	64	66	68	73
Spring	103	103	104	120
Summer	152	160	162	176
Fall	73	72	78	88

The 16 data points were used to estimate a regression equation to explain the variation in demand. The trend component was captured by the variable "Period", and then qtr2 represents the possible seasonal component for spring, qtr3 represents the possible seasonal component for Summer, and qtr4 represents the possible seasonal component for Fall. Given the following minitab output...

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Coefficients

Term        Coef   SE Coef  T-Value  P-Value   VIF
Constant   58.74   2.59     22.68    0.000
Period      1.28   0.228     5.65    0.000    1.06
qtr2       38.46   2.89     13.29    0.000    1.51
qtr3       92.18   2.92     31.56    0.000    1.54
qtr4        6.14   2.96      2.07    0.063    1.58
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Note: Period is the trend component, qtr2 is Spring, qtr3 is Summer, and qtr4 is Fall. The seasonal variables were binary

Is the trend component significant? Explain.

Is there any evidence that there is a seasonal trend if alpha is 10%? Explain.

Write out the regression equation and use it to predict the water usage in each quarter in Year 5.

Usage =

Quarter   Year 5

Winter   _____

Spring   _____

Summer   _____

Fall   _____

6. (12 pts.) Lakewood Fashions must decide how many lots of assorted ski wear to order for its three stores. Information on pricing, sales, and inventory costs has led to the following payoff (profit) table, in thousands.

Order Size	Low	Demand Medium	High
1 lot	12	15	15
2 lots	9	25	35
3 lots	6	35	60

a. What decision should be made by the optimist? Show your work.
b. What decision should be made by the conservative? Show your work.
c. What decision should be made using the minimax regret approach? Show your work.

Initial Problem:

Suppose you have just inherited $250,000 from your late uncle's estate. You have decided to invest the money in one of two alternatives. The first alternative involves purchasing one or two condominiums in Auburn that you will put on the rental market. The other alternative is to put the money in the stock market.

If you choose to purchase the condominium alternative, the next decision you will need to make is whether or not you choose to buy one high-end condo across the street from campus or 2 less expensive units that are several miles from campus. The demand, as well as the rental price, for such off-campus housing is largely dependent on the supply of student housing. That supply will depend on whether the university or other private builders decide to build more housing. You believe that there is a 70% chance that the demand will stay fairly constant for the next 10 years but there is a 30% chance that the supply could go up thus causing the demand, and rental income, for your condos to go down.

The following is a payoff table with prior probabilities for both condo alternatives given each of the states of nature.

States of Nature

Decision alternatives	Constant Demand (.70)	Less Demand (.30)
Two Cheaper Condos	400,000	350,000
One Hi-end	500,000	300,000

Instead of putting your money in a condo, you are considering putting your money in the stock market. There are 3 states of nature that could occur in the stock market: strong growth, moderate growth, and collapse. The following is the payoff table with prior probabilities for the stock market alternative:

Decision Alternative	Strong (.2)	Moderate (.6)	Collapse (.20)
Stock Alternative	690,000	450,000	0 (zero)

7. (10 pts.) Draw the tree and solve this problem using the expected value approach.

8. (10 pts.) Given the information in the previous problem, suppose that you have decided to choose the condo alternative, therefore the possibility of you choosing the stock alternative is not a possibility. What is the expected value of perfect information for the demand of the condos in the future? Draw your tree and provide the calculations for this problem.

9. (10 pts.) Given the information in the initial problem, again suppose that only the condo alternative is under consideration, therefore the possibility of you choosing the stock alternative is not a possibility. Under what range of probabilities of demand would a person choose to go with the "Two Cheaper Condos" versus the "One Hi-end" condo?

10. (10 pts.) Given the information in the initial problem, and again suppose that only the condo alternative is under consideration. Assume that you have found a fairly reliable source to predict the demand for the merchandise and you estimate the following conditional probabilities:

Order Size	Demand	
	Constant(S1)	Less(S2)
Two Cheaper Condos	400,000	350,000
One Hi-End Condo	500,000	300,000

P(F|Constant)=.85 P(U|Constant)=.15 | Note: A Favorable response will indicate a Constant demand

P(F|Less) =.10 P(U|Less) =.90 | An Unfavorable response will indicate Less demand

What is the value of this sample information? Draw your tree. The prior probabilities are P(Constant Demand)=0.7 and P(Less Demand)=0.3.

11. (2 pts) In your own words, what is the meaning of a standard deviation and what does it represent?

12. (2 pts) Suppose the true population mean and standard deviation from which a sample was taken is 15 and 3, respectively. What is the likelihood that I would select a single value from this population and that value is greater than 18? Use the empirical rule (68-95-99.7) to solve.

13. (2 pts) Suppose I take a sample of size 9 from the population in the problem above, what is the probability that the mean of that sample is greater than 18? Use the empirical rule (68-95-99.7) to solve. Remember $\sigma_{xbar} = \sigma/\sqrt{n}$

14. (2 pts) In one sentence, what does the central limit theorem state? In another sentence, why is it so important to us?

15. (2 pts) Suppose that someone has just given you a data set with 400 observations. The person told you that he was really interested in finding the impact one variable (that is controllable) has on another variable (of interest) in the dataset. Assuming that the variable of interest is continuous, and the controllable variable is categorical and has two categories. Half of the observations are from one category and the other half of the observations are from the second category. Explain how you would go about determining the relationship that the controllable variable has on the variable of interest. State the statistical test you would run and why you would use this approach?