Mid-term Examination-November 2017

Student's Full Name:_____.

Student's ID:_____.

CRN No:_____ .

Branch: _____.

Instructor Name: _____.

QUANTITATIVE METHODS (STAT -201)	Day: Tuesday Date: 07/11/2017 Time: 18:00-19:00

The exam will be administered in class by your professor. You will be given 60 minutes (1 hour) to complete the exam. This is a closed book exam. You MAY NOT use any instructional material (e.g., textbook, notes, etc.) to assist you on the exam. You may bring and use pens, pencils and calculator. You are **NOT** allowed to share calculators.

Total Points

True/False	____/5
MCQ	____/5
Short Answer	____/15
Total	____/25

Time allowed (60 minutes)
Good Luck

Midterm Examination – November-2017

QUANTITATIVE METHODS
(STAT -201)

Time: 1 Hour **Marks- 25**

Answer all the Questions on the same question paper.

Section-I

State whether the following statements are True or False. **(5X1=5 Marks)**

1. Model variables can be controllable or uncontrollable (True)
2. The minimum EOL criterion will always result in the same decision as the maximum EMV criterion. (True)
3. A goal of many waiting line problems is to help a firm find the ideal level of services that minimize the cost of waiting and the cost of providing the service. (True)
4. When trial forecasts with different time series techniques are developed, the method which should be selected must result in the highest *MAD* (False)
5. A feasible solution to a linear programming problem must be a corner point of the feasible region. (False)

Section-II

Circle the right answer from the answers given and fill in the table below: (5X1=5 Marks)

1. Which of the following is not one of the steps in the quantitative analysis approach?
   a) Defining the Problem analysis
   b) Developing a Solution
   c) Testing a Solution
   d) Implementing the Results

2. Sales for boxes of Girl Scout cookies over a 4-month period were forecasted as follows: 50, 60, 55, and 63. The actual results over the 4-month period were as follows: 55, 57, 60, 66. What was the MSE of the 4-month forecast?
   a) -2.5
   b) 4
   c) 17
   d) 59.5

3. If computing a causal linear regression model of $Y = a + bX$ and the resultant r^2 is very near zero, then one would be able to conclude that
   a) There is a negative relationship between X and Y.
   b) There is a positive relationship between X and Y.
   c) A multiple linear regression model is a good forecasting method for the data.
   d) None of the above

4. In a two-channel system, the arrival rate of customers follows a Poisson distribution, while the service time follows a normal distribution. What type of queuing model applies here?
   a) M/M/2.
   b) G/D/2
   c) M/G/2.
   d) 2/M/M.

5. In solving a Linear Program where the objective function is to **minimize** $X_1 + 2\ X_2$, the corner points are the following: (10, 30), (15, 25) and (15, 30). The optimal solution will therefore be:
   a) (15, 30)
   b) (10, 30)
   c) (15, 25)
   d) None of the above

Question	1	2	3	4	5
Answer	**c**	**c**	**D**	**c**	**c**

Section-III

Answer all the Questions (Short answer) **(5X3 =15 Marks)**

1. A company is currently registering a loss. Relevant information are the following:
   Fixed costs = $90,000;
   Total variable costs = $60,000;
   Total revenue = $ 120,000;
   The quantity sold = 10,000 units.

   (a) Compute the current loss for this company.
   (b) Compute her BEP.
   (c) What is the quantity to be sold in order to reach a profit equal to $30,000?

   Solution:
   (a) Profit = Revenue – costs = 120,000 – (90,000 + 60,000) = $-30,000
   The loss = $30,000
   (b) We have

$$f = \$90{,}000;\ v = \frac{60{,}000}{10{,}000} = \$6;\ s = \frac{120{,}000}{10{,}000} = \$12$$

$$BEP = \frac{f}{s-v} = \frac{90{,}000}{12-6} = 15{,}000\ units$$

   (c) Let's denote by X the quantity to be sold in order to reach a profit equal to $30,000.
   Profit = s.X – f – v.X = -f +(s – v) X
   X= (Profit + f)/(s - v)
   X= (30,000 + 90,000)/ (12 – 6) = 120,000/6 = 20,000 units

2. A concessionaire for the local ballpark has developed a table of conditional values for the various alternatives (stocking decision) and states of nature (size of crowd).

	States of Nature (size of crowd)		
Alternatives	Large	Average	Small
Large Inventory	$11,000	$6,000	-$1,000
Average Inventory	$7,500	$6,000	$3,000
Small Inventory	$4,500	$3,000	$2,500

   If the probabilities associated with the states of nature are 0.30 for a large crowd, 0.50 for an average crowd, and 0.20 for a small crowd, determine:

   a. The opportunity loss table.
   b. Minimum expected opportunity loss (EOL).

Answer:
a. Opportunity loss table

	States of Nature (size of crowd)			
Alternatives	Large	Average	Small	EOL
Large Inventory	0	0	$4,000	**800**
Average Inventory	$3,500	0	0	1,050
Small Inventory	$6,500	$3,000	$500	3,550
Probabilities	0.3	0.5	0.2	

b. Minimum EOL = $800 for Large Inentory

3. Daily high temperatures in the city of Riyadh for the last week have been:

Day	1	2	3	4	5	6	7
Actual temperature	32	34	34	33	32	31	-
Forecast temperature	-	-	-	33.33	33.67	33	32
Forecast errors	-	-	-	-0.33	-1.67	-2	-
Absolute Forecast error	-	-	-	0.33	1.67	2	MAD= 1.33

Fill in the table to:

a. Provide forecasts for the days 4-7 using the **three-day moving average** method.
b. Calculate the **mean absolute deviation (MAD)** based on the three-day moving average, covering all days in which you can have a forecast and an actual temperature.

4. In a simple regression model study, the following results are found:
The regression line is $\hat{Y}$ =5+2X

Given $\sum(Y - \bar{Y})^2 = 26$ and,

$\sum(Y - \hat{Y})^2 = 4$.

Calculate SST, SSE, SSR and r^2

	Formula	Numerical result
SST	$\sum(Y-\bar{Y})^2$	26
SSE	$\sum(Y-\hat{Y})^2$	4
SSR	SST – SSE	22
r^2	SSR/SST	22/26 = 0.8462

5. In Tyson's mechanic shop customers arrive at the rate of 3 per hour and the Tyson's mechanic can install wheels at the rate of 5 per hour. As per M/M/1 model, calculate:
   a) The average number of customers in the system
   b) The average time a customer spends in the system
   c) The percent idle time

Answer

λ=3

μ=5

a. $L=\frac{\lambda}{\mu-\lambda}$ =3/ (5 – 3) = 3/2 =1.5 customers in system on average.

b. $W=\frac{1}{\mu-\lambda}$ =1/(5-3)= ½ = 0.5 hour or 30 minutes on average a customer spend in system

c. $P_0=1-\frac{\lambda}{\mu}$ = 1 – 3/5 = 2/5 = 0.4 Probability that there are 0 customers in system.

THE-END