

**KABARAK**



**UNIVERSITY**

**UNIVERSITY EXAMINATIONS  
2010/2011 ACADEMIC YEAR**

**FOR THE DEGREE OF MASTER OF BUSINESS**

**ADMINISTRATION**

**COURSE CODE: OMGT 510**

**COURSE TITLE: QUANTITATIVE TECHNIQUES**

**STREAM: MBA – S1**

**DAY: TUESDAY**

**TIME: 4:00 – 7:00P.M.**

**DATE: 21/12/2010**

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**INSTRUCTIONS:**

- Answer Question **ONE** and any other three questions

**PLEASE TURN OVER**

**QUESTION ONE (15 MARKS)**

a) Solve the following equations using the Cramer's method:

$$2x_1 + 3x_2 + 4x_3 = 29$$

$$x_1 + x_2 + 2x_3 = 13$$

$$3x_1 + 2x_2 + x_3 = 16$$

**(4 marks)**

b) The daily profit for a shop selling a certain type of toy is given by

$$P(x) = -x^2 + 18x + 144, \text{ where } x \text{ is the number of toys sold.}$$

(i) Find the total number of toys sold that will maximize the daily profits

(ii) Determine the maximum daily profit.

**(5 marks)**

c) Given the input- output matrix

	<b>INDUSTRY</b>			
	<b>Water</b>	<b>Electric Power</b>	<b>Agriculture</b>	<b>Final</b>
<b>Demand</b>				
<b>INDUSTRY: Water</b>	100	400	240	260
<b>Electric Power</b>	100	80	480	140
<b>Agriculture</b>	300	160	240	500
<b>Others</b>	500	160	240	-

Find the output matrix if final demand changes to 300 for water, 200 for electric power and 400 for agriculture. Round your entries to two decimal places

**(6 marks)**

**QUESTION TWO (15 MARKS)**

a) A brokerage survey reports that 30 percent of individual investors have used discount broker; one which does not charge the full commissions. In a random sample of 8 individuals, what is the probability that

i) Exactly two of the sampled individuals have used a discount broker?

ii) At least four have used a discount broker?

**(4 marks)**

b) The yearly income for a group of 10,000 professional people is normally distributed with a mean of 60,000 dollars and a standard deviation of 5,000 dollars.

i) What is the probability that a person from this group has a yearly income between 46,000 and 72,000 dollars?

ii) What is the probability that a person from this group has a yearly income less than 45,000 dollars?

iii) How many of these people have yearly incomes over 75,000 dollars?

**(6 marks)**

- c) The time it takes salespersons in a certain company to meet their yearly quotas is 10.6 months on the average with a standard deviation of 1.8 months. Find the probabilities that in a sample of 36 of the company's salespersons the average time it will take to meet their yearly quotas is
- (i) at most 11 months
  - (ii) between 10.0 and 10.5 months
- (5 marks)**

**QUESTION THREE (15 MARKS)**

- a) Distinguish between the following:
- (i) Type I and type II errors
  - (ii) One tailed and two tailed tests
- (4 marks)**

- b) Three suppliers provide the following data on defective parts

SUPPLIER	PART QUALITY		
	Good	Minor defect	Major defect
A	90	3	7
B	170	18	7
C	135	6	9

Using  $\alpha = 0.05$ , test for independence between Part quality and Supplier. What does the result of your analysis tell the purchasing department? **(6 marks)**

- b) The following are the number of sales which a random sample of nine salesmen of industrial chemicals in Nairobi and a random sample of six salesmen of industrial chemicals in Mombasa made over a fixed period of time:

Nairobi: 41 47 62 39 56 64 37 61 52  
 Mombasa: 34 63 45 55 24 43

Use the  $\alpha = 0.01$  level of significance to test whether the difference between the means of these two samples is significant. **(5 marks)**

**QUESTION FOUR (15 MARKS)**

- a) Airline passengers arrive randomly and independently at a passenger screening facility at a major international airport. The variance arrival rate is 10 passengers per minute. What is the probability
- (i) of no arrivals in a one minute period?
  - (ii) that three or more passengers arrive in a one minute period?
  - (iii) at least one arrival in a 15 second period? **(4 marks)**
- b) The life in hours of a battery is known to be approximately normally distributed, with a standard deviation of 1.25 hours. A random sample 10 batteries has a mean life of  $\bar{x} = 40.5$  hours. Is there evidence to support the claim that the mean life exceeds 40 hours? Use  $\alpha = 0.05$ . **(4 marks)**
- c) Managers of all levels at an organization need adequate information to perform their respective tasks. One study investigated the effect the source has on the dissemination of the information. In this particular study, the sources of information were a superior, a peer and a subordinate. In each case, a measure of dissemination was obtained, with higher values indicating greater dissemination of the information.

Superior	Peer	Subordinate
8	6	6
5	6	5
4	7	7
6	5	4
6	3	3
7	4	5
5	7	7
5	6	5

- (i) Using  $\alpha = 0.05$ , test whether the source of information significantly affects dissemination.
- (ii) What is your conclusion and what does it suggest about the use and dissemination of information? **(7 marks)**

### QUESTION FIVE (15 MARKS)

A study was made by a retail merchant to determine the relation between weekly advertising expenditures and sales. The following data were recorded:

<u>Advertising costs (\$)</u>	<u>Sales (\$)</u>
40	385
20	400
25	395
20	365
30	475
50	440
40	490
20	420
50	560
40	425
25	480
50	510

Summary statistics are  $n = 12$ ,  $\sum x_i = 410$ ,  $\sum x_i^2 = 15650$ ,  $\sum y_i = 5345$ ,  $\sum y_i^2 = 2417925$  and  $\sum x_i y_i = 187325$ .

- Find the equation of the regression line to predict weekly sales from advertising expenditures. **(5 marks)**
- Estimate the weekly sales when the advertising costs are \$35. **(2 marks)**
- Compute 95% confidence interval for the slope of the line in part (a). Give a practical interpretation of this interval estimate. **(5 marks)**
- Calculate the sample coefficient of correlation  $r$  and interpret **(3 marks)**

**QUESTION SIX (15 MARKS)**

a) A multiple regression equation yields the following partial results

Source	Sum of Squares	df
Regression	750	4
Error	500	35

- i) What is the total sample size? **(1 mark)**
  - ii) How many independent variables are being considered? **(1 marks)**
  - iii) Calculate the coefficient of determination and interpret its value. **(3 marks)**
  - iv) Test the hypothesis that none of the regression coefficients is equal to zero. Let  $\alpha = 0.05$ . **(5 marks)**
- b) In a multiple regression equation of two independent variables are considered, and the sample size is 25. The regression coefficients and the standard errors are as follows:  $\hat{\beta}_1 = 2.676$ ,  $s(\hat{\beta}_1) = 0.56$ ,  $\hat{\beta}_2 = -0.880$  and  $s(\hat{\beta}_2) = 0.71$ . Would you consider deleting either independent variable from the regression equation? Use  $\alpha = 0.05$  **(5 marks)**