

CHUKA



UNIVERSITY

UNIVERSITY EXAMINATIONS

**EXAMINATION FOR THE AWARD OF DEGREE OF
MASTERS OF SCIENCE IN PROCUREMENT AND LOGISTICS MANAGEMENT**

MSOM 821: QUANTITATIVE METHODS

STREAMS: MSOM YISI

TIME: 3 HOURS

DAY/DATE: TUESDAY 03/12/2019

2.30 PM – 5.30 PM

INSTRUCTIONS:**ANSWER QUESTION ONE AND ANY OTHER THREE QUESTIONS****QUESTION ONE (40 MARKS)**

- (a) Explain the significance of quantitative methods in management. [6 marks]
- (b) Solve the following system of linear equations
 $x + y + z = 6$
 $x + 2y + 3z = 14$
 $-x + y - z = -2$
- (c) The following regression results were obtained from an empirical investigation to establish predictors for wage rate among technical staff in public universities.

$$\widehat{wage} = .284 + 0.092 \text{ education} + 0.0041 \text{ experience} - 0.022 \text{ staff size}$$

P-value	(.104)	(.007)	(.117)	(.000)
Se	(2.204)	(.0154)	(.000853)	(.0045)

Where P-values and standard errors appear in parentheses below the estimated coefficients.
Required:

- (i) Compute the t-statistic for staff size [2 marks]
- (ii) Interpret R-square of the model [2 marks]

- (iii) Interpret the intercept term and coefficients on each independent variable [4 marks]
- (iv) Use p-values to identify significant predictors of wage rate at 5% level of significance. [2 marks]
- (c) The following information is obtained concerning a research on non-performing loan accounts of 100 business borrowers running small and medium enterprise shops:

	Shops in		
	Urban	Rural	Total
Run by Men	13	5	18
Run by women	60	22	82

Required:

- (i) Test the hypothesis that there is no difference in the number of non-performing loans borrowed by men and women in urban and rural areas. (Use Chi-square test at 5% level of significance) [8 marks]
- (ii) Would your conclusion change after applying Yate's correction? [5 marks]
- (iii) Highlight five important characteristics of chi-square test. [5 marks]

QUESTION TWO

- (a) Explain the following concepts as used in hypothesis testing
- (i) Type 1 error [2 marks]
- (ii) Non-parametric test [2 marks]
- (b) A sample of 400 gas cylinders is found to have a weight 13.47 kg. Can it be reasonably regarded as a sample from a large population with mean weight of 13.5 kg and standard deviation 1.30 inches? Test at 5% level of significance. [6 marks]
- (c) A company is engaged in producing three products P, Q and R. The following data is available.

Products	P	Q	R
Profit/ unit ksh.	4.0	3.0	5.0

The products are processed three different operations. The time (hours) required to produce one product in each of the operations and the daily capacity (hrs) available for each operation centre are given below.

	Products			
Operation	P	Q	R	Daily Capacity (hrs)
1 st	2	3	2	400
2 nd	3	2	2	350
3 rd	1	4	2	300

The company wishes to determine the product mix that would yield maximum profit.

- Formulate the above problem mix that would yield maximum profit.
- Develop the first simplex tableau for the problem [5 marks]

QUESTION THREE

- (a) The daily demand function for a product is $P = Q - 20 + 1000/Q$ while the total cost function for producing the product is given by $C = -10Q^2 + 200Q$ where P is the price per unit and Q is the number of units produced and sold.

Required:

- How many units must be sold to maximize profit? [6 marks]
 - What is the selling price at this level of production? [2 marks]
 - What is the maximum possible profit [2 marks]
 - Explain the meaning of steady state and initial conditions as applied in markov process. [4 marks]
- (c) Eight bank employees were given training in five cycles on use of technology in service delivery. Evaluation was conducted each month to determine effectiveness of training measured by average number of customers served daily. The number of customers served after the first and fifth cycle of training is given below:

Employee Number	1	2	3	4	5	6	7	8
Customer served after one Cycle	50	42	51	26	35	42	60	41
Customers served after five cycles	62	40	61	35	30	52	68	51

Do the number of customers served from first to fifth cycle show an improvement? (Use paired t-test at 5% level of significance) [6 marks]

QUESTION FOUR

- (a) Explain areas of application of linear programming modelling technique in management. [6 marks]

- (b) A steel plant produces x tons of steel per week at an average cost of $\frac{1}{3}x^2 - 7x + 11 + \frac{50}{x}$. Where x is the number of units produced. Determine
- (i) The total cost of producing 10 units [3 marks]
- (ii) Find the output level at which the marginal cost (MC) attains its minimum (using the concept of derivative) [5 marks]
- (a) A study was conducted to determine whether introduction of ATM services by deposit taking SACCOS would influence the number of customers served on a per day basis. One group of seven SACCOS that had adopted ATM services recorded an average of 120, 150, 110, 160, 140, 140, and 160 customers per day respectively. A second group of five DT SACOs, which had not adopted the technology registered 80, 100, 140, 100 and 130 customers per day respectively. Test at 5 percent level whether there is significant evidence that introduction of ATM has increased the number of customers served per day. [6 marks]

QUESTION FIVE

- (a) Distinguish between correlation and regression analysis. [4 marks]
- (b) The table below shows data on annual household expenditure (X) and annual household income (Y) for 12 households in a peri-urban set up.

Household No.	X (ksh.000)	Y (ksh.000)
1	9	15
2	19	20
3	11	14
4	14	16
5	23	25
6	12	20
7	12	20
8	22	23
9	7	14
10	13	22
11	15	18
12	17	18

- (i) Use the table to compute and interpret the Pearson correlation coefficient for the data. [4 marks]
- (ii) Test the significance of correlation coefficient at 5% level. [4 marks]
- (iii) Fit a simple linear regression model for the data. [5 marks]

- (c) Three merchants R, S and M purchased biscuits of different brands B1, B2 and B3. R purchased 10 packets of B1, 7 packets of B2 and 3 packets of B3. M purchased 4 packets of B1, 7 packets of B2 and 8 packets of B3. If brand B1 costs sh. 40, B2 costs sh.50 and B3 costs sh. 60 per packet, use matrix operation to find the amount of money spent by the three merchants individually. [3 marks]
-