

CHUKA



UNIVERSITY

UNIVERSITY EXAMINATIONS

THARAKA UNIVERSITY COLLEGE

EXAMINATION FOR THE AWARD OF DEGREE OF MASTERS IN BUSINESS ADMINISTRATION

MSOM 821: QUANTITATIVE METHODS

STREAMS: MBA Y1S1

TIME: 3 HOURS

DAY/DATE: THURSDAY 8/08/2019

2.30 P.M - 5.30 P.M.

INSTRUCTIONS:

- Answer question ONE and any other THREE questions
- Do not write anything on the question paper

QUESTION ONE (40 MARKS)

- (a) Explain the classification of Quantitative techniques and its role in business and industry. (10 marks)
- (b) The company’s management is interested in determining the company’s needs for certain repair parts. The company has 3 types of vehicles X, Y and Z operating in different regions of the country as shown in the table below;

X	Y	Z	Region
300	150	400	coast
200	110	300	central
100	90	100	eastern
300	120	200	western

On the basis of studies of maintenance records in different parts of the country, the management has determined the average number of repair parts needed per car during a year as summarized in the table below

X	Y	Z	Repair parts
16	17	15	Fan belts
8	12	5	Plugs
7	9	5	tyres
7	4	6	batteries

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Using matrix method determine-

- i. The total demand for each type of car (2 marks)
 - ii. The total number of each repair part required (2 marks)
 - iii. The cost per unit in shillings for fan belts, plugs, tyres and batteries is given by Matrix $C = (1250 \ 800 \ 6500 \ 8000)$ Calculate the total cost for all repair parts. (5 marks)
- (c) Solve the following system of linear equations by crammers' rule
- $$4x_1 + 2x_2 + 6x_3 = 28$$
- $$3x_1 + x_2 + 2x_3 = 20$$
- $$10x_1 + 5x_2 + 15x_3 = 70$$
- (6 marks)
- (d) Outline the assumptions of linear regression model (4 marks)
- (e) The table given below shows the data obtained during outbreak of small pox:

	Attacked	Not attacked	Total
Vaccinated	31	469	500
Not vaccinated	185	1315	1500
Total	216	1784	2000

- i. With help of χ^2 at 5% level of significance, test the effectiveness of vaccination in preventing the attack from smallpox. (6 marks)
- ii. Highlights conditions necessary for application of chi-square test (5 marks)

QUESTION TWO

- (a) Explain the following concepts as used in markov process (5 marks)
- i. Stochastic process
 - ii. Transition matrix
 - iii. Steady state
 - iv. Recurrent State
 - v. Initial condition
- (b) consider that two brands of toothpaste, Y and Z that share the market in the ratio of 60% to 40% respectively of customers. If in every week 80% of Y's customers retain the brand but 20% switch to product Z where as 70% of Z's customers retain brand but 30% percent switch to brand Y. Analyse the exchange in share market per week hence the equilibrium state. (7 marks)
- (c) Given the marginal revenue function $MR = 200 - 4Q$ and marginal cost function $MC = 50 + 2Q$. The total cost of producing 10 units is Kshs.700.

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Determine;

- (i) The total cost function (2 marks)
- (ii) The level of production at which profit is maximum (3 marks)
- (iii) The profit function (3 marks)

QUESTION THREE (20 MARKS)

(a) A firm uses two machines in the manufacture of two products A and B. Each unit of product A requires 1 hour and 2 hours on machine I and II respectively. Each unit of product B requires 2 hours and 1 hour on machine I and II respectively. It is required that product A units should not exceed 320. The contribution margin on product A and B and C is Sh. 6 and Sh. 4 per unit respectively. The machine hours available on the three machines I and II are 720 and 780 respectively.

Required:-

- i. Formulate the above problem as a linear programming problem. (5 marks)
 - ii. Develop the first and the second tableau only. (6 marks)
- (b) State the major assumption of input-output model (3 marks)
- (c) Explain the concept as used in research statistics (8 marks)
- i. Two tailed
 - ii. A null hypothesis
 - iii. Type 1 error

QUESTION FOUR

- (a) Differentiate between correlation and regression. (4 marks)
- (b) The total Revenue (TR) and the Total Cost (TC) are as follows
 $TR = 200Q - 10Q^2$
 $TC = Q^2 - 20Q + 1000$

Determine;-

- i. Maximum Q (3 marks)
 - ii. Minimizes Total Cost and hence the Minimum total Cost (4 marks)
 - iii. Maximum Profit. (3 marks)
- (c) Memory capacity of 9 students was tested before and after training. Using t- test at 5% level of significance, State whether the training was effective or not from the following scores; (6 marks)

student	1	2	3	4	5	6	7	8	9
Before (X_{Bi})	10	15	9	3	7	12	16	17	4

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After (X_{Ai})	12	17	8	5	6	11	18	20	3
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QUESTION FIVE

(a) The following regression results were obtained from an empirical investigation involving 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) (.0017) (.000)
Se (2.204) (.0154) (.000853) (.0045)
 $n = 526, R^2 = .3.$

Required:

- (i) How many staff were sampled? (1 mark)
- (ii) Interpret R-square of the model (2 marks)
- (iii) Interpret the intercept term and slope coefficient on staff size (4 marks)

(b) Consider the following 4 sector input output model.

Sector	1	2	3	4	D	X
1	x_{11}	x_{12}	x_{13}	x_{14}	D_1	X_1
2	x_{21}	x_{22}	x_{23}	x_{24}	D_2	X_2
3	x_{31}	x_{32}	x_{33}	x_{34}	D_3	X_3
4	x_{41}	x_{42}	x_{43}	x_{44}	D_4	X_4
V	V_1	V_2	V_3	V_4	<i>GNP</i>	
X	X_1	X_2	X_3	X_4		

Determine;

- i. Primary input purchased by sector 3 (1 mark)
- ii. How much sector 2 purchased from sector 4 (1 mark)
- iii. GNP by expenditure method (2 marks)
- iv. Input output coefficient (3 marks)
- v. Derive the input output model (7 marks)

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