CHUKA UNIVERSITY

UNIVERSITY EXAMINATIONS

CHUKA & THARAKA

FIRST YEAR EXAMINATION FOR THE AWARD OF MASTER OF BUSINESS ADMINISTRATION AND AGRIBUSINESS MANAGEMENT

AGBM 841/MSOM 821: QUANTITATIVE TECHNIQUES

STREAMS: MBAD, AGBM (Y1S1) **TIME: 3 HOURS**

DAY/DATE: MONDAY 16/4/2018 **2.30 P.M. – 5.30 P.M.**

INSTRUCTIONS:

- **Answer question ONE and any other THREE questions**
- **Mathematical tables are provided**

QUESTION ONE

(a) In the recent times, there is a growing tendency by organizations to turn to quantitative techniques as a means of solving many of the problems that arise in business and industrial enterprises. Comment on this statement by explaining the meaning and role of quantitative techniques in business and industry. [8 marks]

(b) A research carried out by KBS in Kenya showed the following consumption habits of households on luxury goods and services.

Gross income per month ksh.	Number of consumers buying luxury goods and services
Upto 5,000	20
5001 – 10000	15
10001 – 15000	25
15001 – 20000	28
20001 – 25000	23
25001 – 30000	35
30001 – 35000	38
35001 and above	40

(i) Calculate the arithmetic mean, median and mode. Comment on each of one of them. [6 marks]

(ii) Does the research show that luxury goods and services are consumed by high income earners? Support the answer. [4 marks]

(c) Outline the assumptions of linear regression model. [5 marks]

(d) Discus the conditions that should be satisfied before chi-square test can be applied. [5 marks]

(e) Loan repayment among rural households is believed to be dependent

(f) Primarily on the family size, age and level of education. The possible model for the data is multiple linear regression model of the form $Y = \beta_o + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon$ where $X_1, X_2 \text{and} X_3$ are explanatory variables representing family size, age and level of education respectively and ε is the random disturbance term assumed to be normally distributed with mean zero and variance σ^2

The following results were obtained using data analysis software.

SUMMARY OUTPUT

Regression statistics

Multiple R	0.799
R squared	0.638
Adjusted R square	0.608
Standard error	13.021
Observations	40.00

ANOVA

	Df	Ss	Ms	F	SigF
Regression	3	10746.29	3582.097	21.126	0.000
Residual	36	6104.085	169.558		
Total	39	16850.375			

	Coefficient	Standard error	t-stat	P-value	Lower 95%	Upper 95%
(constant)	11.306	7.0315	1.546	0.431	-3.530	26.142
Family size	0.464	0.130	3.564	0.001	0.200	0.728
Age	0.156	0.206	0.754	0.455	-0.263	0.574
Gender	20.071	4.651	4.315	0.000	10.638	29.505

Required:

(i) How many households were sampled? [1 mark]

(ii) Interpret R-square of the model. [2 marks]

(iii) Interpret the slope coefficient and intercept term [4marks]

(iv) State with reasons whether or not the independent variable of the model significantly affect loan repayment. [3 marks]

(v) Is the overall model significant? Explain [2 marks]

QUESTION TWO

(a) A firm has analyzed its operating conditions and has developed the following functions

Total revenue $= \log^2 + 200\text{q}$

Total cost $= q^2 - 20q + 1000$ where q is the number of units provided and sold.

Determine the value of q that

(i) Maximizes revenue and hence the maximum revenue. [3 marks]

(ii) Minimizes total cost and hence minimum total cost. [3 marks]

(iii) Maximizes profit and hence maximum profit. [2 marks]

(b) XYZ ltd has described two functions to explain the operations of the firm. The operations manager found the revenue function to be

$\partial R/\partial x = 25 - 5x - 2x^2$ and the marginal cost function to be $t = \frac{\partial c}{\partial x} = 15 - 2x - x^2$

where x is the level of output.

The cost is ksh 375 when the level of output is 15 units. Determine the profit maximizing output and the total cost at that point. [5 marks]

(c) Distinguish between type I and type II errors as used in statistical inference.[2 marks]

QUESTION THREE

(a) Explain the stages of hypothesis testing. [5 marks]

(b) You are working as a purchase manager for a company. The following information has been supplied to you by two manufacturers of electric bulbs.

	Company A	Company B
Mean life (in hours)	1300	1288
Standard deviations (in hours)	82	93
Sample size	100	100

Which brand of bulbs are you going to purchase if you desire to take a risk of 5%.

[5 marks]

(c) The sales data of an item in six shops before and after a special promotional campaign are

Sales	A	B	C	D	E	F
Before the promotional campaign	53	28	31	48	50	42
After the campaign	58	29	30	55	56	43

Can the campaign be judged as a success? Test the hypothesis at 5% level of significance.

[5 marks]

QUESTION FOUR

(a) Differentiate between correlation and regression. [4 marks]

(b) A company wants to assess the impact of R & D expenditure on its annual profit. The following table presents the information for the last eight years.

Years	Research & development expenditure	Annual profit
2017	9000	45000
2016	7000	42000
2015	5000	41000
2014	10000	60000
2013	4000	30000
2012	5000	34000
2011	3000	25000
2010	2000	20000

Estimate the regression equation and predict the annual profit for 2016 for an allocated sum of 100,000 as R & D expenditure. [7 marks]

(c) State and explain the assumptions of a linear programming model. [4 marks]

QUESTION FIVE

(a) Explain the following concepts as used in Markov process

(i) Steady state probabilities [2 marks]

(ii) State probabilities [2 marks]

(iii) Initial conditions [2 marks]

(b) Solve the following system of linear equations using matrix theory. [2marks]

$4x_1 + x_2 - 5x_3 = 8$

$-2x_1 + 3x_2 + x_3 = 12$

$3x_1 - x_2 + 4x_3 = 5$

(c) A company is considering using Markov theory to analyse brand switching between three different brands. Survey data has been gathered and has been used to estimate the following transition matrix for the probability of moving between brands each month.

		To Brand		
From Brand	1	0.80	0.10	0.10
	2	0.03	0.95	0.02
	3	0.20	0.05	0.75

The current market shares are 45%, 25% and 30% for brand 1, 2 and 3 respectively.

(i) What will be the expected market shares after two months have elapsed.[3 marks]

(ii) What is the long run prediction for the expected market share for each of the three brands. [2 marks]

(d) Explain some application of Markov theory in a firm. [2 marks]
