UGANDA MARTYRS UNIVERSITY

FACULTY OF BUSINESS ADMINISTRATION AND MANAGEMENT

QUANTITATIVE METHODS (SUPPLEMENTARY/ SPECIAL)

Examination

2013 - 2014

BAM I – NKOZI CAMPUS

Date: 12th/ 08/ 2014

Time allowed: 3 hours

Instructions

1. Do not write anything on the question paper
2. Attempt question any four questions
3. Show all workings and they have to be clear and tidy

QUESTION ONE

a. Given the following conditions for constrained optimisation

$$x_1 - 2x_2 + x_3 = 3$$
$$2x_1 + x_2 - x_3 = 5$$
$$3x_1 - x_2 + 2x_3 = 12$$

Find the equilibrium values x_1, x_2 and x_3 using Cramer's rule or the inverse method **(9 marks)**

b. Shell Uganda has retail fuel stations in four regions of Uganda selling fuel in thousands of litres per day and tens of cooking gas cylinders. Northern Uganda stations sell ('000) 35 litres of petrol x_1, 60 Diesel x_2, 55 Kerosene x_3 and 45 Cooking gas cylinders; Central Uganda 80 litres of petrol x_1, 65 Diesel x_2, 50 Kerosene x_3 and 38 Cooking gas x_4; Western Uganda 29 litres of petrol x_1, 36 litres Diesel x_2, 24 litres of kerosene x_3 and 32 Cooking gas x_4; Eastern Uganda 62 Petrol, 49 Diesel x_2, 54 kerosene x_3 and 33 Cooking gas x_4.

i. Express the present inventory in an equation form and derive a matrix out of the equation **(6 marks)**

ii. In the (i) above, if the price of petrol is Shs. 3700, Diesel Shs. 3200, kerosene Shs.2700, Gas cylinder Shs. 300,000. Use vector multiplication to find the total value of sales in the four regions of Uganda. **(10 marks)**

QUESTION TWO

Riham a biscuit manufacturing company plans to produce two types of biscuits, one with a round shape and another with a square shape. The following resources are used in manufacturing the biscuits,

The resources used are shown in Table.

Resources	**Requirement/unit**		**Daily availability**
	Round	**Square**	
Raw material	100	115	1500 grams
Machine	10	12	720 minutes
Man power	3	2	240 minutes

If the unit profit of round and square biscuits is Shs 300 and Shs 200 respectively

i. Develop a linear programming model **(5 marks)**

ii. Determine the optimal combination requirement for profit. **(10 marks)**

iii. How many round and square biscuits should be produced to maximize total profit. **(6 marks)**

iv. Give two reasons for your answer in (iii) above. **(4 marks)**

QUESTION THREE

Three telecommunication companies MTN, UTL, AIRTEL are competitors for an array of telephone customers in Karamoja. The table below shows the flow of customers between 1st March and 1st April 2014

			GAINS FROM			LOSSES TO				
			MTN	UTL	AIRTEL	MTN	UTL	AIRTEL		
Company	**No. of customers as at 1st MARCH**	**Market share**							**No. of customers as at 1st APRIL**	**Market share**
MTN	1640		0	80	100	0	40	48		
UTL	3280		40	0	60	80	0	68		
AIRTEL	3880		48	68	0	100	60	0		

i. State the number of customers for each company at the in April. **(3 marks)**

ii. State the market shares for the months of March and April. **(6 marks)**

iii. Obtain the matrix of Transition probabilities **(6 marks)**

iv. Predict the market shares of 1st May and 1st June. **(6marks)**

v. Suggest what should the firms do to improve their market shares? **(4 marks)**

QUESTION FOUR

a) If you want to earn an annual rate of 10% on your investments, how much should you earn on an investment of 500,000 in 6 months? **(3 marks)**

b) How much should you deposit initially in an account paying 10% in order to have Shs. 100,000,000 in 30 years?

i) Compounded monthly **(3 marks)**

ii) Compounded daily **(3marks)**

c) MPK LTD is currently undertaking an investment of that is expected to generate a minimum return of 16.5% per annum. The following are the estimates of the project's cash flows

Year	0	1	2	3	4
Cash flows(Shs. '000)	(52,000)	17,500	25,000	22,000	9,250

REQUIRED

The firm currently has a required rate of return of 15%. However, there is some concern about this figure and the investment should be appraised at 15% and 19%.

a) Calculate the Net Present Value **(NPV)** of the investment at the two discounting rates. **(10 marks)**

b) Calculate the Internal Rate of Return **(IRR)** the company should expect and interpret your results. **(6 marks)**

QUESTION FIVE

A Marketing Manager is attempting to derive a sales-output relationship for the company. The following data has been collected over the past two years.

Units of sales output Sales	**Cost of sales (Shs '000s)**
10	32
20	39
40	58
25	44
30	52
40	61
50	70
45	64

a) Using linear regression analysis, derive the relationship between the variables (sales units and cost of sales) and interpret your answer. **(12 marks)**

b) Estimate the strength of the relationship between the variables (sales units and cost of sales) and explain the principle of the co-efficient of determination **(8 marks)**

c) Using relevant examples explain the time series components **(5 marks)**

QUESTION SIX

a. What is the relationship between integration and differentiation **(3marks)**

b. A cost function is

$$\textbf{Shs(c)} = \mathbf{Q^2-30Q+200}$$

Where Q = quantity of units produced

Find the point of minimum cost **(3 marks)**

b) Given a demand function;

Where: **P = 80-3Q**

What is the Marginal Revenue? **(5 marks)**

c. Airtel Uganda has developed a new product "Extra airtime". They can either test the market or abandon the project. The details are set out below,

Test the market cost at $ 50,000; likely outcomes are favourable (P=0.7) or failure (P=0.3). If favourable, they could either abandon or launch it when the demand is anticipated to be

Low	P=0.25	**Loss**	$100,000
Medium	P=0.6	**Profit**	$150,000
High	P=0.15	**Profit**	$450,000

If the test market indicates failure the project would be abandoned. Abandonment at any stage results in a gain of $30,000 from the staff used. Airtel will make decisions based on expected monetary value.

i. Draw the decision tree showing the nodes and probabilities for this problem **(8 marks)**

ii. Use expected monetary value to determine the optimal course of action for Airtel Uganda **(6 marks)**

GOOD LUCK