UGANDA MARTYRS UNIVERSITY

END OF SEMESTER II EXAMINATION

FACULTY OF BUSINESS ADMINISTRATION

NAME OF THE PROGRAM: BAM

COURSE TITLE: Quantitative Methods 1 (QM 1201) (NKOZI/LUBAGA)

INSTRUCTIONS: ATTEMPT ANY FIVE QUESTIONS

DURATION: 3 HOURS

1. a) Sampling methods are widely used for the collection of statistical data in industries and business. Explain **FOUR** of the following, illustrating your answer with practical examples

i. Simple random sampling
ii. Stratified sampling
iii. Systematic sampling
iv. Cluster sampling
v. Population, sampling and sample frame
vi. Quota sampling (12 marks)

b) The table below shows the summarized sales of W&V limited

Sales 00 Ugx	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89
Clients	5	4	2	5	6	8	4	6

Determine the

i. Mean sales (02 marks)
ii. Modal sales (02 marks)
iii. Variance (02 marks)
iv. Standard deviation (02 marks)

2. a) While giving at least two examples explain the following

i. Fixed costs (02 marks)
ii. Variable costs (02 marks)
iii. Special costs (02 marks)

b) A manufacturer knows that if x (hundred) products are demanded in a particular week.

- The total cost function ($Ugs\ 000$) is $14 + 3x$
- The total revenue ($Ugs\ 000$) is $19x - 2x^2$

i. Derive the total profit function (03 marks)
ii. Find the profit break even points (03 marks)
iii. Calculate the level of demand that maximizes profit and the amount of profit obtained (04 marks)

c) What is the difference between marginal cost and marginal revenue and state the condition to obtain maximum profit in relation to marginal cost and marginal revenue (04 marks)

3. Explain the difference between the following (you can use examples to help you explain)

Simple interest and compound interest (03 marks)

Arithmetic progression and geometric progression (03 marks)

b) Given the progression 2, 5, 8, 11,14,.....

i) find the 15^{th} term of the progression (02 marks)

ii) the sum of the first 15 terms (02 marks)

c) With the help of mathematical expressions and examples, explain any **THREE** of the following

i) Mutually exclusive events

ii) independent events

iii) Conditional events

iv) Complement of an event (06 marks)

v) Union of events

d) During planting season a farmer treats $\frac{2}{3}$ of his seeds and $\frac{1}{3}$ of the seeds are left untreated. The seeds which are treated have a probability of germinating of 0.8 while the untreated seeds have a probability of germinating of 0.5, find the probability that a seed selected at random

(i) will germinate

(ii) had been treated, given that it had germinated. (04 marks)

4. a) What is meant by size of a matrix and explain the condition for matrices to be multiplied together (02 marks)

b) With the help of illustrations and examples explain an identity matrix and a square matrix. Hence show the relationship between the two. (04 marks)

c) Solve the following simultaneous equations using any matrix method (03 marks)

$$p + q = 1$$
$$q - 7 = 2p$$

d) if $A = \begin{pmatrix} 2 & 1 \\ 1 & 2 \end{pmatrix}$ *and* $B = \begin{pmatrix} 3 & 2 \\ 4 & -1 \end{pmatrix}$. Find

i) B^{-1} (02 marks)

ii) $(AB)^{-1}$ (03 marks)

e) The table shows the number passengers on the three AXE Bus services between two towns Kampala and Mbarara and the price of each ticket per son of each service

Departure time	Class		
	Comfort	Excursion	Economy
6:30 am	15	35	60
11:30 am	12	40	70
4:00 pm	8	50	34
Price (Ugs)	60,000	35,000	30,000

I) Find the total number of passengers departing at 11:30 am (01 mark)

II) Construct two matrices of price and number of passengers to represent the information from the table above (02 marks)

III) Use the matrices you have formed in (ii) above to obtain the total revenue from each departure time (03 marks)

5. a) Explain a feasible region and a linear programming problem (02 marks)

b) If x and y are both ≥ 0, describe in words the position of the defined (feasible) region for the following inequalities in relation to their corresponding lines.

(i) $4x - 2y \leq 100$ (02 marks)

(ii) $4x + 3x \leq 120; y \geq 20$ (02 marks)

a) A production line can be set up to produce either product X or product Y. The following table gives the breakdown for each product

PRODUCT	LABOUR (MINUTES)	MATERIALS (Kg)	TESTING (MINUTES)
X	30	2	3
Y	15	4	4

In any one week only 30 hours of labour and 280 Kg of material is available and owing to cost and availability, the testing equipment must be used for at least 4 hours. In addition, because of existing orders, at least 20 X products must be produced. The contribution from each unit of X produced is Ugs 48,000 and each unit $of\ Y, Ugs$ 36,000.

Find

(i) the weekly production that will maximize contribution and calculate this resulting contribution

(ii) the weekly production that minimises contribution and calculate this resulting contribution

(iii) the percentage utilisation of the available labour for both minimum and maximum contribution. (14 marks)

6. a) Find the first derivative of the following

(i) $y = 8x - 4 + \frac{2}{x}$ (03 marks)

(ii) $xy = 2x^2 - 5x + 4$ (02marks)

(iii) $y = (4 + x)(x - 1)$ (03 marks)

b) Find the x-value of the single turning point on the graph of $y = 2x^2 - 8x$ and determine whether it is minimum or maximum point. (04 marks)

c) Integrate the following functions with respect to x

(i) $9x^2$ (01 mark)

(ii) $8x^3 - 3x^2 + 8x - 10$ (02 marks)

(iv) $\frac{2}{x^3}$ (02 marks)

d) If $\frac{dy}{dx} = 4x - 3$. If it is known that when $x = 1, y = 5$, find $y\ in\ terms\ of\ x$ (03 marks)

7. a) Explain t~~he following any~~ any **FOUR** of the following

i) time series

ii) the trend variation

iii) seasonal variations

iv) cyclic variations

v) irregular variations (08 marks)

b) Explain the THREE advantages of time series analysis (03 marks)

c) Explain forecasting and the three types of forecasts (04 marks)

d) A summary of the sales made for the nine years was recorded as follows

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998
Sales	40	40	45	55	70	75	40	35	30

Determine

(i) a three- year moving Total

(ii) a three- year moving average (05 marks)

END