CHUKA  **UNIVERSITY**

UNIVERSITY EXAMINATIONS

FIRST YEAR EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF CO-OPERATIVE MANAGEMENT.

BCOM 162: BUSINESS MATHEMATICS II

STREAMS: BCOM **TIME: 2 HOURS**

DAY/DATE: THURSDAY 7/12/2017 **8.30 A.M - 10.30 A.M.**

INSTRUCTIONS:

- **Answer Question ONE and any other TWO Questions**
- **Do not write on the question paper**

QUESTION ONE

(a) Discuss the stages involved in decision making process. [4 Marks]

(b) Solve for x_1, x_2 and x_3 in the following simultaneous equation using matrix

$4x_1+x_2-5x_3=8$

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

$3x_1-x_2+4x_3=5$ [6 Marks]

(c) Find the derivative of the following fraction $y = \frac{20x^2-6x+3}{2x^2+x}$ [3 Marks]

(d) Given the function $y = 2x^3 - 3x^2 + 6x + 2$, find the maximum value of y. [3 Marks]

(e) Given the fraction $P(Q) = 250Q - 3Q^2 + 0.04Q^3$

Evaluate

(i) $\frac{\partial^2 P}{\partial Q^2}$ [2 Marks]

(ii) $\int p(q)\partial Q$ [2 Marks]

(f) In a certain study, it was found out that a student who stays in the library for over 2 hours has a failure rate of 1%. The one who stays in the library for less than 2 hours has a failure rate of 2.5% while the one who does not go the library at all has a failure rate of 6%. In a University, 60% of the students stay in the library for over 2 hours, 30% stay in the library for less than 2 hours and the rest never go to the library. Find the probability that the student went to the library less than 2 hours given that he or she failed. [5 Marks]

(g) An economy has two industries P1 and P2. The industries have the following technology matrix A=$\begin{matrix}0.2 & 0.4\\ 0.4 & 0.8\end{matrix}$. If the gross production matrix x=$\begin{pmatrix}32\\ 79,\end{pmatrix}$ find the final demand matrix D=$\begin{pmatrix}d_1\\ d_2\end{pmatrix}$ [5 Marks]

QUESTION TWO

(a) Given that $C = \begin{pmatrix}-3 & 4 & 2\\ 5 & 0 & 4\end{pmatrix}$ and $D = \begin{pmatrix}-6 & 4\\ 2 & 3\\ 3 & 2\end{pmatrix}$ and also T=CD

Find the inverse of T [5 Marks]

(b) A company is considering investing in one of the three investment opportunities, A, B and C under the given economic condition. The pay off matrix in (Sh) for this situation is given below

	States of nature		
Investment Opportunities	1	2	3
A	5000	7000	3000
B	-2000	10,000	6000
C	4000	4,000	4000

Determine the best investment opportunity using the following principles

(i) Maxi-min [2 Marks]
(ii) Max-max [2 Marks]
(iii) Mini-max [2 Marks]
(iv) Horwicz, assume $\propto = 0.3$ [2 Marks]
(v) Laplace [2 Marks]

(c) From past experience, a machine is known to be set up correctly in 90% of the occasions. If the machine is set up correctly, then 95% of goods parts are expected but if the machine is not set up correctly, then the probability of good parts is only 30%. On a particular day, the machine is set up and the first component produced is found to be good. What is the probability that the machine was set up correctly? [5 Marks]

QUESTION THREE

(a) State and briefly explain areas of application of calculus in business. [6 Marks]

(b) Optima products Ltd produces a product names "Vanilla", The average revenue and total cost function of the product are given be

$$AR = 250 - Q$$
$$TC = -500 + 31Q^2 + 10Q$$

Where AR = Average revenue function in Kshs. Millions
TC = Total cost function in Millions
Q = The number of units of vanilla sold.

Required:

(i) The profit function [4 Marks]
(ii) The level of output that will maximize profit. [4 Marks]
(iii) The maximum profit [3 Marks]

(c) Use Cramers rule to solve for x, y and z

x + 2y + 3z = 3

2x + 4y + 5z = 4

3x + 5y + 6z = 8 [3 Marks]

QUESTION FOUR

(a) State and explain the three decision making environments. [6 Marks]

(b) An economy produces two produces, A and B. The following table gives the supply and demand positions for the two sectors in millions of Kenya shillings.

		Consumers		Final demand
		A	B	
Producers	A	150	100	100
	B	200	300	1500

Required

(i) Technology matrix for the two sectors. [3 Marks]

(ii) Leontief matrix [3 Marks]

(iii) Determine the output required to satisfy the consumers if final demand changes to 120 for A and 180 for B. [5 Marks]

(c) Evaluate the following

$\int_1^3 (10x^4 + 3x^2 + 3)\partial x$ [3 Marks]

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