CHUKA   **UNIVERSITY**

UNIVERSITY EXAMINATIONS

EXAMINATION FOR THE AWARD OF DIPLOMA IN PROCUREMENT AND LOGISTICS MANAGEMENT, DIPLOMA IN ACCOUNTANCY AND DIPLOMA IN BUSINESS MANAGEMENT

DIBM 0122: BUSINESS MATHEMETICS II

STREAMS: DPLM, DIAC &DIBM YIS1   **TIME: 2 HOURS**

DAY/DATE: WEDNESDAY 12/04/2023   **11.30 A.M – 1.30 P.M**

INSTRUCTIONS:

Answer question one and any other two questions

Do not write on the question paper

QUESTION ONE

(a) Distinguish between the following concepts as used in business mathematics.

    (i)   Column matrix and row matrix.   [3 marks]

    (ii)   Equiprobable events and mutually exclusive events   [3 marks]

    (iii)   Sample point and sample space   [3 marks]

(b) A company produces two products namely: product A and product B. The cost of producing 8 units of product A and 12 units of product B is ksh 360 while the cost of producing 12 units of product A and 15 units of product B is ksh 480. Using matrix algebra, find the cost of producing one unit of product A and one unit of product B.

                                                          [4 marks]

(c) KQ airlines operates daily flights from Nairobi to Amsterdam. On these flights, 40% of the passengers are white and the rest are black. Further scrutiny of the records indicates that 25% of the white passengers are female and 30% of the black passengers are male. One passenger is to be selected on a free air ticket for the next flight.
Required:

(i)   Represent the above information in a probability tree diagram.   [3 marks]

(ii)   Find the probability that the selected passenger is a male.   [2 marks]

(iii) Find the probability that the selected passenger is a white given that she is a female.   [4 marks]

(d) Explain the meaning of decision theory and describe three decision making environments.   [8 marks]

QUESTION TWO

(a) Distinguish between open Leontief model and closed Leontief model giving relevant examples.   [4 marks]

(b) A businessman has three alternatives open to him, each of which can be followed by any of the four possible events. The conditional payoffs (in Ksh '000') for each action –event –combination are as shown below:

Alternatives	Pay off conditions			
	A	B	C	D
X	8	10	6	-4
Y	-4	12	18	-2
Z	14	6	0	8

The probability of occurrence of conditions are 0.4, 0.3, 0.2 and 0.1 for A,B,C and D respectively.

Required:

Determine which alternative the businessman should choose if he adopts.

(i)   Maximin criterion   [2 marks]

(ii)   Maximax criterion   [2 marks]

(iii) Hurwics criterion, his degree of optimism being 0.7.   [3 marks]

(iv)   Laplace criterion   [3 marks]

(v)	Minimax regret criterion	[3 marks]
(vi)	Expected monetary value criterion	[3 marks]

QUESTION THREE

(a) Explain five application of calculus in business. [5 marks]

(b) A firms's total revenue is a function of the time taken (in minutes) of advertising in the electronic media. The total revenue is given by the function:

R = 90X +150Y -40XY -10X^2-25Y^2

Where: X is the time taken in advertising in the television per day and Y id the time taken advertising on the radio per day.

Required:

(i) The total time of advertising in each medium that would maximize revenue.

[7 marks]

(ii) Determine the maximum revenue. [2 marks]

(c) Solve the following simultaneous equation. [6 marks]

2x-y+3z = -2

-x+3y-2z=9

4x-2y+z=1

QUESTION FOUR

(a) An economy has two interrelated sectors cocoa and tea, whereby the two sectors are interdependent. To produce 1 unit of cocoa output, it requires 0.4 units of cocoa itself and 0.3 units from tea. To produce 1 unit of tea output, it requires 0.2 units from cocoa and 0.1 units from tea itself. Given that the final demand in the economy would 200 and 300 metric tonnes of cocoa and tea outputs respectively.

(i) Derive the technology matrix [2 marks]

(ii) Determine the gross production in the economy in the economy so as to satisfy both intermediate and final demands. [6 marks]

(iii) Determine the primary inputs [3 marks]

(b) A firm marginal revenue function is given MR $=240 -0.6Q^2$ and the marginal cost production is given by MC $=150+0.3Q^2$

Required:

(i)   Total revenue function   [2 marks]

(ii)   Total cost function   [2 marks]

(iii)   Find the level of output that is needed to maximize the firm's profit and the maximum profit.   [5 marks]