LAIKIPIA UNIVERSITY

UNIVERSITY EXAMINATIONS

2ND SEMESTER 2023/2024 ACADEMIC YEAR

FIRST YEAR EXAMINATION FOR THE DEGREE OF BACHELOR OF COMMERCE

BCOM 124: BUSINESS MATHEMATICS II

STREAM: ***TIME: 2 HRS***

DAY: MONDAY [2.30-4.30 P.M] ***DATE: 15/04/2024***

THIS QUESTION PAPER CONSISTS OF FIVE (5) PAGES

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Attempt QUESTION ONE (COMPULSORY) AND ANY TWO

QUESTION ONE

a) With examples define the following terms as they are used in matrix algebra **(6 marks)**

i. Square matrix

ii. Identity matrix

iii. Singular matrix

b) Solve the following pairs of equations using inverse method **(5 marks)**

$4x + 2y + 3z = 4$

$5x + 6y + 1z = 2$

$2x + 3y = -1$

c) Solve the equations using Cramer's rule **(5 Marks)**

$a_{11} X_1 + a_{12} X_2 = b_1$ ……(i)

$a_{21} X_1 + a_{22} X_2 = b_2$ ……(ii)

d) In a certain town, there are two daily newspapers. The citizen and the mirror. A researcher interested in the reading habits of the town found the following; Of the readers who read citizen in a given day,50% do so the following day while the rest change to mirror. Of those who read the mirror in a given day,40% change to citizen the following day. Yesterday the readership levels were 30% citizen and 70% mirror: Determine the readership level of both dailies;

i. Today **(3 Marks)**

ii. Tomorrow **(3Marks)**

iii. If this process persists long enough, what will be the eventual readership **(5 Marks)**

e) An economy with two industries T_1 and T_2 has the following technological matrix

$$A = \begin{bmatrix} 0.1 & 0.2 \\ 0.2 & 0.4 \end{bmatrix}$$

If the final demand is $\begin{bmatrix} 40 \\ 60 \end{bmatrix}$. Find the production for each industry **(3 Marks)**

QUESTION TWO

(a) Distinguish between the following terms as used in decision making environment

i) Decision making under certainty and decision making under uncertainty **(2 Marks)**

ii) Pure versus mixed strategy **(2 marks)**

(b) (i) Outline FOUR characteristics of a game in relation to decision making environment under conflict **(4 Marks)**

(ii)Two firms are competing for business under the conditions that one firm's gains is another firm's loss. Determine the optimum strategies and the value of the game for the following layout matrix **(4 Marks)**

	FIRM A	FIRM B	
		Medium advertising	Heavy advertising
	Medium Advertising	65	50
	Heavy Advertising	50	55

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

	State of Nature		
Investment Opportunity	E_1	E_2	E_3
A	5000	7000	3000
B	2000	10000	6000
C	3000	4000	4000

Required; Determine the best investment opportunity using the following criteria;

(i) Maximax **(2 marks)**

(ii) Maximin **(2 marks)**

(iii)Hurwitz (Alpha= 0.3) **(3 marks)**

(iv)Suppose the states of nature occur with probabilities E_1= 0.3, E_2= 0.5 and E_3 = 0.2, which investment would you recommend **(5 Marks)**

QUESTION THREE

(a) Define the following probability terms **(5 Marks)**

(i) Outcome

(ii) Sample space

(iii) An event

(iv) Independent events

(v) Equally likely events

(b) An electronic firm purchases its supplies from 4 different suppliers namely; Alpha Ltd supplies 20%, Beta ltd supplies 30%, Gamma ltd supplies 25% and Omega ltd supplies 25%. Alpha ltd tends to supply the best quality since only 35 of their supplies are defective, Beta supplies are 4% defective, gamma ltd supplies are 7% defective and omega supplies are 6.5% defective.

Required:

(i) Define the probability of selecting a defective item? **(3 Marks)**

(ii) A defective supply was discovered in two shipments. What is the probability that it came from Alpha Ltd? **(3 Marks)**

(iii)What is the probability that the defective supply came from Alpha ltd, Beta ltd, Gamma Ltd and Omega ltd? **(4 Marks)**

c) A manager has the following investment options to consider: A risky project promising returns of 4 million with a probability of 0.6 and 5 million with a probability of 0.4. A diversified portfolio promising returns of 6 million with a probability of 0.3 and 4 million with probability of 0.7. using Expected monetary value (EMV) technique, advise the manager on the best option. **(5 Marks)**

QUESTION FOUR

(a) Jolly intends to invest in a project costing KES 800,000 with a rate of return of 10% p.a. The expected net cash inflow from the project are shown in the table below;

Year	Cash inflow
2019	250,000
2020	270,000
2021	460,000
2022	305,000
2023	295,000

Required: Appraise the project using the following techniques

(i) Pay Back period **(5 Marks)**

(ii) Net Present Value (NPV) **(5 Marks)**

(iii)Profitability Index (PI) **(5 marks)**

(b) Mary Intends to buy a second hand car valued at KES 700,000 after 3 years. At the beginning of the first year, she deposits KES 320,000. At the beginning of the second year she deposited KES 100,000. How much does she have to deposit at the beginning of the third year to enable her buy the car? Take the rate of compound interest to be 12% p.a. **(5 Marks)**