

LAIKIPIA



UNIVERSITY

UNIVERSITY EXAMINATIONS

2ND SEMESTER 2022/2023 ACADEMIC YEAR

**FIRST YEAR EXAMINATION FOR THE DEGREE OF
BACHELOR OF COMMERCE**

BCOM 124: BUSINESS MATHEMATICS II

STREAM:

TIME: 2 HRS

DAY: THURSDAY [8.30-10.30 A.M.]

DATE: 13/04/2023

THIS QUESTION PAPER CONSISTS OF FIVE (5) PAGES

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Attempt QUESTION ONE AND ANY TWO**QUESTION ONE (30 MARKS) (COMPULSORY)**

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

- (i) Outcome
- (ii) Sample space
- (iii) An event
- (iv) Independent events
- (v) Equally likely events

(b) A company has tendered for two contracts A and B. the probability of winning contract A is $\frac{2}{3}$ and that of winning contract B is $\frac{3}{5}$. Determine;

- i) Probability of winning no contract **(3 Marks)**
- ii) Probability of winning at least one contract **(3 Marks)**
- iii) Probability of winning either contract A or B **(2 Marks)**
- iv) Probability of winning either contract A and B **(2 Marks)**

(c) 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, 60% do so the following day while the rest change to mirror. Of those who read the mirror in a given day, 50% change to citizen the following day. Yesterday the readership levels were 35% citizen and 65% mirror: Determine the readership level of both dailies;

- i) Today **(3 Marks)**
- ii) Tomorrow **(3 Marks)**
- iii) If this process persists long enough, what will be the eventual readership **(3 Marks)**

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

$$A = \begin{bmatrix} 0.3 & 0.4 \\ 0.2 & 0.6 \end{bmatrix}$$



If the final demand is $\begin{bmatrix} 40 \\ 60 \end{bmatrix}$. Find The production for each industry that will satisfy both the intermediate and final demand (6 Marks)

QUESTION TWO (20 MARKS)

(a) A firm has analyzed their operating conditions prices and costs and has developed the following functions: Total Revenue $R= 400Q +4Q^2$ and Total cost $C= Q^2+ 10Q + 30$ Where Q is the number of units sold. The firm wishes to maximize profit

Required

- i) What quantity should be sold? (3 marks)
- ii) What would be the amount of maximum profit? (3 marks)
- (b) Evaluate $\int(25-5x-5x^2) dx$ (2 marks)
- (c) A management scientist has developed 2 functions to describe operations of a firm. He found the marginal revenue (MR) to be $25-5Q-2Q^2$ and marginal cost (MC) to be $15-2Q-Q^2$ where Q is the level of output. Determine the level of output Q where profit is maximum. (5 marks)
- (d) Under certain economic conditions. The payoff matrix for this situation is given below.

	State of Nature		
Investment Opportunity	E ₁	E ₂	E ₃
A	10000	14000	6000
B	4000	20000	12000
C	6000	8000	4000

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

- i) Maximax (2 marks)
- ii) Maximin (2 marks)
- iii) Hurwitz (Alpha= 0.4) (3 marks)



QUESTION THREE (20 MARKS)

a) Use Cramer's rule to solve

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

$$2x + 4y + 5z = 4$$

$$3x + 5y + 6z = 8$$

(6 Marks)

b) Given that $A = \begin{bmatrix} 2 & -2 \\ 0 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} -4 & 3 \\ 3 & 5 \end{bmatrix}$ find matrix C such that $3C + A = B$ **(6 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. **(8 Marks)**

QUESTION FOUR: (20 MARKS)

(a) Jolly intends to invest in a project costing KES 900,000 with a rate of return of 15% p.a. The expected net cash inflow from the project are shown in the table below;

Year	Cash inflow
2019	350,000
2020	300,000
2021	400,000
2022	300,000
2023	250,000

Required; Appraise the project using the following techniques

- i) Pay Back period **(3 Marks)**
 ii) Net Present Value (NPV) **(4 Marks)**
 iii) Profitability Index (PI) **(3 marks)**



iv) Internal rate of return (IRR) **(4 marks)**

(b) Mary Intends to buy a second-hand car valued at KES700,000 after 3 years. At the beginning of the first year, she deposits KES 250,000. 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.

(6 Marks)

QUESTION FIVE (20 MARKS)

a) Define the following terms used in game theory:

i) Dominance. **(2 marks)**

ii) Saddle point. **(2 marks)**

iii) Mixed strategy. **(2 marks)**

iv) Value of the game **(2 marks)**

b) Consider the two-person zero sum game between players A and B given the following pay-off table:

		Player B Strategies			
		1	2	3	4
Player A Strategies	1	2	2	3	-1
	2	4	3	2	6

Required:

i) Using the maximin and minimax values, is it possible to determine the value of the game? Give reasons. **(3 marks)**

ii) Use graphical methods to determine optimal mixed strategy for player A and determine the value of the game. **(9 marks)**

