FACULTY	AGRICULTURE, ENGINEERING AND NATURAL RESOURCES		
SCHOOL	AGRICULTURE AND FISHERIES SCIENCE		
DEPARTMENT	ANIMAL PRODUCTION, AGRIBUSINESS & ECONOMICS		
SUBJECT	MATHEMATICAL ECONOMICS & LINEAR PROGRAMMING		
SUBJECT CODE	AEC 3612		
DATE	NOVEMBER 2023		
DURATION	**3 HOURS**	**MARKS**	**100**

SECOND OPPORTUNITY EXAMINATION QUESTION PAPER

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This question paper consists of Three (3) pages including this front page

Instructions

- Answer all questions and all questions carry equal marks (20 marks)
- Please write legibly and number your questions clearly
- Show your calculations to two decimal places

UNIVERSITY OF NAMIBIA EXAMINATIONS

QUESTION 1 **[20 MARKS]**

a) Define the following and use examples to illustrate your understanding:

i. Non-Singular matrix (3)

ii. The Determinant (3)

iii. Minors (3)

iv. Cofactors (3)

v. The Adjoint Matrix (4)

b) Find the domain of the following defined functions:

(i) $x^2 - 1$ (2)

(ii) $\frac{1}{x^3-1}$ (2)

QUESTION 2 **[20 MARKS]**

a) Find the following integrals:

(i) $\int 30x^4 dx$ (2)

(ii) $\int (24 + 7.2x) dx$ (3)

(iii) $\int 0.5x^{-0.5} dx$ (3)

(iv) $\int (48x - 0.4x^{-1.4}) dx$ (3)

(v) $\int (65x - 1.5x^{-2.5} + 1.5x^2) dx$ (3)

b) If the demand function is $= 32 - 4x - x^2$. Find the consumer surplus if

(i) $x_0 = 3$ (3)

(ii) $y_0 = 27$ (3)

QUESTION 3 **[20 MARKS]**

a) Given that the following shows the linear demand schedule: P = 60 −2Q

c) Derive the Total revenue function (3)

d) Derive the marginal revenue (3)

e) Graphically show your TR and MR equations (4)

f) Solve for quantity that will maximize revenue. (4)

g) Calculate the $\int_0^{15} MR\ dx$, $\int_{15}^{30} MR\ dx$ and $\int_0^{30} MR\ dx$ and compare your results. (6)

QUESTION 4 **[20 MARKS]**

a) Find X_1 and X_2 using Cramer's rule from the following set of simultaneous equations:

$$5X_1 + 0.4X_2 = 12$$
$$3X_1 + 3X_2 = 21$$ (6)

b) If A= $\begin{bmatrix} 1 & 2 & 3 \\ 0 & 1 & 1 \\ 1 & -1 & 0 \end{bmatrix}$ and B= $\begin{bmatrix} 0 & 1 & 2 \\ 2 & 1 & -1 \\ -1 & 0 & 1 \end{bmatrix}$ then prove that AB ≠ BA (8)

c) If A = $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 5 \\ 3 & 5 & 12 \end{bmatrix}$ then find A^{-1} (6)

QUESTION 5 **[20 MARKS]**

Neudamm farm plans to extend a maximum of 11 new camps on its farm operation. They will extend these camps in one of the three sizes: beef cattle camps - requires N$4.125 million to build with 30 employees to operate. Small stock camps – requires N$8.25 million to build and 15 employees to operate. Dairy cattle and pig camps – N$12.375 million to build and 45 employees. UNAM can dedicate N$82.5 million in construction capital and 300 employees. On the average; beef cattle - nets N$1.2 million annually. Small stock – N$2 million and dairy cattle and pig – N$2.6 million.

i. Set up a LP problem based on the information given above. (9)

ii. How many of each should they expand to maximize revenue? Hint, use any of the approaches demonstrated in class. (11)

End