FACULTY	AGRICULTURE AND NATURAL RESOURCES		
DEPARTMENT	AGRICULTURAL ECONOMICS		
SUBJECT	PRODUCTION ECONOMICS		
SUBJECT CODE	AEC 3682		
DATE	NOVEMBER 2023		
DURATION	**3 HOURS**	**MARKS**	**100**

FIRST OPPORTUNITY EXAMINATION

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

Instructions

Answer all the questions

All questions carry equal marks (20 marks each)

Please write legibly and number your questions clearly

You are allowed to use a calculator

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QUESTION 1 **[20]**

a) Describe the difference between diminishing marginal returns and the decreasing returns to scale. Provide an example of each. [6]

b) Consider the production function of maize output as follows: Y = 100 + 400X – 2 X^2, where Y = maize output (kg) and X = fertilizer application (kg), calculate the
i) Level of input that will maximize maize output. [4]
ii) Optimum quantity of maize that could be produced [4]

c) Explain, using relevant example(s) the difference between complementary and the supplementary products. [6]

QUESTION 2

a) A local livestock producer utilizes compost waste to develop an organic fertilizer product. The fertilizer is prepared for retail sale in 50 kg bags. The retail sale price is $5.00 per bag. The average variable cost per bag is $2.80 and average annual fixed costs are $60,000.

These three pieces of information are: Average Per Unit Sale Price = $5.00 per bag
Average Per Unit Variable Cost = $2.80 per bag
Average Annual Fixed Costs = $60,000.00

Required: Perform the breakeven analysis and find
i. Equations for total revenue and total costs [2]
ii. Breakeven point in units [2]
iii. Break-Even Sales in units [2]

b) Let $C\ (y)$ be the total cost function of a tomato enterprise. If $C(y) = 144 + 16y^2$. Determine the minimum average cost. [4]

c) Given the following combinations of Y_1 and $Y_2$to be produced given a fixed amount of the resources, answer the questions below.

Table: Profit maximization for two enterprises given a fixed amount of the resources

Combination Number	Units of Output (Y_2)	Units of Output (Y_1)
1	0	4,600
2	800	4,000
3	1,400	3,400
4	1,900	2,700
5	2,300	1,900
6	2,600	1,000
7	2,800	0

i. Calculate the appropriate marginal rate of substitution. [6]

ii. If the prices of Y_1 and Y_2 are N$4 and N$2, respectively, determine the enterprise combination that will maximize profit. [4]

QUESTION 3 **[20]**

a) Describe any five (5) properties of Cobb-Douglas production function. [10]

b) Linear programming can provide a precise solution only if a number of assumptions are met. Identify and briefly explain these assumptions. [10]

QUESTION 4 **[20]**

Suppose Ogongo farm is producing potatoes. They employed 200 workers, and they harvest 2000kg of potatoes per hour.

i. what is the productivity of each employee per hour? [5]

ii. the farm manager realized that the amount harvested is too low and may not finish harvesting on time, so he decided to hire more workers. He hired 1 worker and total production per hour was 2100kg, he hired a second one the total production harvested per hour was 2150kg, he hired a third one and production was 2200kg per hour. What can you say about the marginal returns of this farm's production and hiring additional workers? [10]

iii. Draw a TPP to show the production exhibited by the farm. [5]

QUESTION 5 **[20]**

Suppose that you make two types of disc ploughs, smooth and grooved. Each smooth plough requires 2 units of steel and 6 units of aluminum and 12 special components for the holding rod. Each grooved disc plough requires 5 units each of steel and 5 units of aluminum and 5 special components for the holding rod. Purchases of steel are limited to 100 units per day, aluminum is limited to 120 per day and special components limited to 180 units per day.

a) If profits are N$300 on each smooth plough and N$200 on each grooved plough, how many of each should be produced to yield the maximum profit? [15]

b) What is the maximum profit? [5]

ALL THE BEST