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2nd SEM. 2014/2015



UNIVERSITY OF SWAZILAND

FINAL EXAMINATION PAPER

PROGRAMME: BSc. in Agricultural Economics and Agribusiness Management Year III

COURSE CODE: AEM 306

TITLE OF PAPER: QUANTITATIVE METHODS FOR AGRIBUSINESS DECISIONS

TIME ALLOWED: 2: 00 HOURS

INSTRUCTION: 1. ANSWER ALL **FOUR** QUESTIONS.
2. EACH QUESTIONS CARRIES 25 POINTS

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**QUESTION 1. (25 points)**

1.1. A retailer sells two products, Q and R, in two shops A and B. The number of items sold for the last 4 weeks in each shop are shown in the two matrices **A** and **B** below, where the columns represent weeks and the rows correspond to products Q and R, respectively.

$$\mathbf{A} = \begin{bmatrix} 5 & 4 & 12 & 7 \\ 10 & 12 & 9 & 14 \end{bmatrix} \quad \text{and} \quad \mathbf{B} = \begin{bmatrix} 8 & 9 & 3 & 4 \\ 8 & 18 & 21 & 5 \end{bmatrix}$$

Derive a matrix for total sales for this retailer for these two products over the last 4 weeks ( 7 points)

1.2 Given the 3×3 matrix $A = \begin{bmatrix} 2 & 1 & 6 \\ 5 & 3 & 4 \\ 8 & 9 & 7 \end{bmatrix}$

(a) use Laplace expansion theorem to find $|A|$

(b) Find A inverse.

(c) Use inverse method to find the solution of the following system of equation :

$$\begin{bmatrix} 2 & 1 & 6 \\ 5 & 3 & 4 \\ 8 & 9 & 7 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$$

(10 points)

1.3 Determine the level of output which is necessary to meet final demands of 300,and 100 respectively when the technological coefficients are given by $\begin{pmatrix} 0.3 & 0.5 \\ 0.4 & 0.2 \end{pmatrix}$ and the economic meaning of 0.5 and 0.4? (8 points)

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**QUESTION *2.*** **(25 points)**

2.1 Differentiate the following with respect to x

$F(x) = e^{-4x^2-3}$

**( 8 points)**

2.2 The demand equation for a particular commodity is 5x+3p=15,whare p Emalangeni is the price per unit when x units are demanded.

Find a) the price function

b) the total revenue function

c) the marginal revenue function

d) the absolute maximum total revenue **(9 points)**

2.3. Find the point of supply elasticity $\varepsilon_s$ from supply function $Q = p^2 + 5$, and determine whether the supply is elastic at p = 4. **( 8 points)**

**QUESTION 3.**

3.1 Calculate the definite integrals.

a) $\int_0^1 x^4 - 6x + 1dx$ **( 4 points)**

b) $\int_1^2 \frac{1}{x}dx$ **( 4 points)**

3.2 Marginal revenue is given by $MR=10-6x-3x^2$. Find the total revenue and average revenue (demand) functions?

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3.3 Prove that marginal cost(MC) must equal marginal revenue(MR) at the profit maximizing level of output?

(9 points)

3.4 The demand and the supply for a certain product ( in hundreds Emalangeni ) in terms of its price ( in cents) are given by the following equations:

$D(P) = \frac{100}{p} - 2$ ( demand)

$S(P) = p-2$ ( supply)

Find a) the consumers surplus **( 4 points)**

b) the producers` surplus, when the market is in equilibrium. **(4 points)**

**QUESTION 4 (25 points)**

4.1 Use the Lagrange –multiplier method to find the stationery value of Z and use the bordered Hessian to determine if the stationary value of Z is a maximum or a minimum.

$U = 5x - y - xy$, subject to $x + y = 12$ . **( 12 points)**

4.2. Use the graphical procedure to solve the following linear programming problem

Maximize $Z = x_1 + 2x_2$,

Subject to $-x_1 + 2x_2 \leq 3$

$x_1 + x_2 \leq 4$

$3x_2 - 7 \leq 0$ and

$x_1 \geq 0, x_2 \geq 0$. **(13 points)**