2nd SEM. 2016

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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CHIEF INVIGILATOR

Question 1.   **(25 points)**

1.1 Given

$$A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} \quad and \quad B = \begin{bmatrix} 2 & 5 \\ 4 & 10 \end{bmatrix}$$

Find A^{-1} and B^{-1} and show whether matrices A and B are singular or non-singular, respectively.   **(8 points)**

1.2. Consider an economy with two goods, X and Y. The matrix of coefficients and the final demand is given by

$$A = \begin{pmatrix} 0.3 & 0.4 \\ 0.5 & 0.2 \end{pmatrix} \text{ and the demand vector } D = \begin{pmatrix} 10 \\ 5 \end{pmatrix}$$

Find the production vector that enables the economy to meet the demand.   **(8 points)**

1.3 Differentiate each of the following.

a). $y = \left(x^2 + 3x - 5\right)^3$

b). $y = x^5 \left(4x + 5\right)^2$

c). $y = \dfrac{x^2}{\left(x+4\right)}$

                                                                                          (9 points)

Question 2.   **(25 points)**

2.1 Find the maximum profit π for a firm, given
total revenue $R = 4000Q - 33Q^2$ and
total cost $C = 2Q^3 - 3Q^2 + 400Q + 5000$, assuming $Q > 0$.   **(8 points)**

2.2. Find the price elasticity of demand at $P = 20$ for the demand function
$Q = 1400 - P^2$?   **(8 points)**

2.3 Given the total cost function (TC)

$$TC = 3Q^2 + 7Q + 12$$

Find (a) the marginal
   (b) the average function and evaluate them at $Q = 3$ and $Q = 5$.

(**9 points**)

Question 3.   **(25 points)**

3.1   Given cost and income functions of a sugar producer

$$C(x) = 1500 - 80x^2$$

and $I(x) = 1400x - 6x^2$ respectively where x is daily production
in tons and $I(x)$ and $C(x)$ are measured in E.

a) For which value of x will the income be maximized?   (5 points)

b) Determine the gross profit and the value of x which will maximize the
gross profit.   (5 points)

3.2   Calculate the definite integrals.

a) $\int_0^1 x^3 + 2x + 5\,dx$ (5 points)

b) $\int_0^1 e^x\,dx$ (5 points)

3.3 The rate of net investment is $I = 40t^{3/5}$, and capital stock at $t = 0$ is 75.
Find the capital function K.   (5 points)

Question 4.   **(25 points)**

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

$$D(P) = 113 - Q^2 \qquad \text{(demand)}$$
$$S(P) = (Q + 1)^2 \qquad \text{(supply)}$$

Find a) the consumers surplus (CS)   **(7.5 points)**

b) the producers` surplus(PS), when the market is in equilibrium. **(7.5 points)**

4.2. A toy manufacturer makes two games: Bong g_1 and Zong g_2 .The profit margin on Bong
is 30;the profit margin on Zong is 20.Bong takes 6 hours of processing ,4 hours of
assembly, and 5 hours of packaging, Zong takes 3 hours of processing,6 hours of
assembly, and 5 hours of packaging. If 54 hours are available for oroessing,48 hours for
assembling, and 50 hours for packaging, what is the profit maximizing output mix in terms of
equations and inequalities? **(5 points)**

4.3 A horticulturist wishes to mix fertilizer that will provide a minimum of 15 units of potash,20
Units of nitrates ,and 24 unites of phosphates. Brand 1 provides 3 units of potash, I units of
nitrates, and 3 units of phosphates; it costE120,Brand 2 provides 1 unit of potash,5 units of
nitrates and 2 units of phosphate; it cost E60.Express the least-cost combination of fertilizers
that will meet the desired specification as equations and inequalities? **(5 points)**