2nd SEM. 2011

UNIVERSITY OF SWAZILAND

SUPPLEMENTRAY 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 ANY FOUR QUESTIONS
2. EACH QUESTIONS CARRIES 25 MARKS

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Question 1.

1.1 Use Cramer's rule to find the value of x,y and that solve the following three equations simultaneously.

$$-x+3y+2z=24$$
$$x+z=6$$
$$5y-z=8$$

(15 marks)

1.2 Consider the situation of a mass layoff (i.e., a factory shuts down)where 3000 people become unemployed and now begin a job search. In this case there are two states; employed(E) and unemployed (U) with an initial vector

x_0 = [E U] = [0 3000]

Suppose that in any given period an unemployed person will find a job with probability 0.9 and will therefore remain unemployed with a probability of 0.1.Additionally,persons who find themselves employed in any given period may lose their job with a probability of 0.3(and will have a 0.7probability of remaining employed).

a. Set up the Markov transition matrix for this problem. **(5 marks)**
b. What will be the number of unemployed people after 1 period? 2 periods? **(5 marks)**

QUESTION 2.

2.1 Find the point elasticity of supply ε_s from the supply function $Q = p^2 + 3p$, and determine whether the supply is elastic at $p = 4$.

(5 marks)

2.2 Given the input-output matrix

$$A = \begin{pmatrix} 0.4 & 0.7 \\ 0.3 & 0.2 \end{pmatrix} \text{and the demand vector } D = \begin{pmatrix} 75 \\ 100 \end{pmatrix}$$

Find the production vectors that enable the economy to meet the demands. **(8 marks)**

2.3 A firm has the following total- cost and demand functions;

$C = 4Q^3 + Q^2 + 4Q + 40$

$Q = 25 - 4p$

a. Write out the total- revenue function R in terms of Q. **(3 marks)**

b. Formulate the total –profit function Π in terms of Q. **(3 marks)**

c. Find the profit – maximizing level of out put Q. **(3 marks)**

d. What is the maximum profit? **(3 marks)**

Question 3.

3.1 The income and cost functions of a sugar producer are

$I(x) = 3x - 2x^2$

and $C(x) = 2x^2 + x + 5$ respectively where x is daily production in tons and I (x) and C(x) are measured in E .

3.11 For which value of x will the income be maximized? **(5 marks)**

3.12 Determine the gross profit and the value of x which will maximize the gross profit. **(5 marks)**

3.13 The producer is taxed at a rate of 42% on the value of x for which it is a maximum. Determine his net profit and the value of x for which if is a maximum. **(5 marks)**

3.2 The demand and the supply for a good both depend upon the price p of the good and the tax rate t : $D = f(p, t)$ and $S = g(p, t)$. For any given value of t , an equilibrium price is a solution of the equation $f(p, t) = g(p, t)$.

Assume that this equation defines p as a differentiable of t. find $\frac{\partial p}{\partial t}$ in terms of the derivatives of f & g **(10 marks)** .

Question 4

4.2 The marginal cost function of a producer in terms of production (P) is given by:

$C'(P) = 3P + P^2 + 153$

Where the total cost is in E

If the fixed cost C_F = E75,find the total-cost function C(P)? **(13 marks)**

4.1 Calculate the definite integrals.

4.11 $\int_0^1 3x + 3dx$ **(6 marks)**

4.12 $\int_0^2 x^2 + 4dx$ **(6 marks)**

Question 5.

5. 1 Use the Lagrange –multiplier method to find the stationery value of Z and use the bordered Hessian to determine the stationary value of Z is a maximum or a minimum.

$Z = xy$, subject to $x + y = 7$. **(5 marks)**

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

$D(P) = x^2 - 5$ (demand)

$S(P) = x^2 - 2x + 81$ (supply)

Find; a) the consumers surplus **(5 marks)**

b) the producers` surplus, when the market is in equilibrium. **(5 marks)**

5.3 Consider the following optimization problem.

Maximize $Z = x_1 + 3x_2$,

Subject to $2x_1 - x_2 <= 5$

$x_1 - 3x_2 <= 7$ and $x_1 >= 0$, $x_2 >= 0$.

5.31 Construct the dual problem for this primal problem. **(5 marks)**

5.32 Solve both the primal problem and dual problem graphically. **(5 marks)**