UNIVERSITY OF KWAZULU-NATAL

EXAMINATIONS: JUNE 2011

SUBJECT, COURSE AND CODE: **AGRICULTURAL ECONOMICS 730**

DURATION: **2 HOURS**   TOTAL MARKS: 70

Internal Examiner	:	Prof GF Ortmann
External Examiner	:	Dr B Grove

**STUDENTS ARE REQUESTED, IN THEIR OWN INTEREST,
TO WRITE LEGIBLY**

NOTE: This paper consists of 4 pages; please see that you have all of them.

ANSWER ALL QUESTIONS

QUESTION 1

Indicate whether the following statements are **TRUE** or **FALSE** and justify your answer.

1.1   To obtain an optimum enterprise mix from an LP model that maximizes farm gross margin does not require specification of resource constraints.   (3)

1.2   The dual (shadow) prices of resources generated by an LP model can serve as useful planning information for farmers.   (3)

1.3   The Savage Regret (minimax) model does not serve any useful purpose for farm planners. (3)

1.4   When including a new machine in a one-year MIP model, its fixed cost should be annualised by dividing its purchase price by the number of years that the machine is expected to last.   (3)

1.5   A sector LP model tends to overstate sector income in the presence of aggregation bias.   (3)

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QUESTION 2

2.1   Construct a normative supply function for Wheat (WHEATSEL) given the following extract from a LP solution:

VARIABLE	VALUE	REDUCED COST
WHEATSEL	500.00	0.00

RANGES IN WHICH THE BASIS IS UNCHANGED:

	OBJ COEFFICIENT RANGES		
VARIABLE	**CURRENT COEFF**	**ALLOWABLE INCREASE**	**ALLOWABLE DECREASE**
WHEATS	3000.00	400.00	200.00

(3)

2.2   The solution to a MOTAD model shows a dual price of 3000 for the Land constraint. Explain how you would interpret this value.   (2)

2.3   Briefly describe how you would derive a step-demand function for a resource from a LP solution.
(2)

2.4   Briefly explain why the step supply and demand functions derived from LP solutions are called **normative** functions.   (1)

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QUESTION 3

3.1   Epoch Feeds manufactures cat feed and bird feed. Cat feed is made from meat, fishmeal and cereal. Bird feed is made from cereal and seed. Nutrient yield, prices and minimum nutrient requirements for one ton of each feed are summarised below:

	Nutrients			Price (R/ton)
	Protein (%)	Carbohydrate (%)	Minerals (%)	
Inputs				
Meat	12	10	1	4000
Fishmeal	20	8	2	5000
Cereal	3	30	1	1000
Seed	10	10	3	2000
Products				
Cat Feed	11	15	2	4000
Bird Feed	5	18	1	3000

Epoch Feeds mixes and packages its feed products. The Mixing Division takes 0.50 hours to mix **a ton** of cat feed and 0.30 hours to mix **a ton** of bird feed. The Packaging Division takes 0.10 hours to package **a ton** of cat feed and 0.20 hours to package **a ton** of bird feed. Formulate an LP model (matrix) to find the optimum mix of products and inputs per eight-hour workday.

(9)

3.2   What would you infer from the solution if the REDUCED COST of cereal is 400?   (2)

3.3   How would you interpret a DUAL PRICE of zero for the constraint on packaging hours? (2)

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QUESTION 4

4.1   Briefly explain how the MOTAD model below could be used to construct an E-V boundary. Can a grain producer benefit from an E-V analysis? How?   (4)

	Wheat (ha)	Sorghum (ha)	D1 (R)	D2 (R)	D3 (R)	RHS
Land (ha)	1	1				L 300
GM (R)	2000	2500				E X
GM Deviations:						
T1 (R)	-180	300	1			G 0
T2 (R)	300	-500		1		G 0
T3 (R)	-120	200			1	G 0
0.5TAD (R)			1	1	1	Min!

4.2   Revise the MOTAD model in Question 4.1 to minimise the Savage Regret (minimax) criterion.   (5)

4.3   Explain what differences are likely to exist in the solutions to the MOTAD and Savage regret models. Which of these models would you prefer to use when advising farmers?   (5)

4.4   Reconstruct the MOTAD model in question 4.1 to maximise Baumol's $L=E-\theta\sigma$ criterion. (5)

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QUESTION 5

5.1   Given the data below, construct a mini-matrix to show how a sector LP model can approximate market equilibrium by maximising producer plus consumer surplus for Crop X: (13)

Crop X	Domestic market	Export market
Price elasticity of demand	-0.5	-10.0
Current consumption (million tons)	5.0	2.0
Current price (R/t)	2000	1500

Use the following quantity levels to segment consumer surplus in each market:
Domestic demand (million tons):   4.0; 5.0; 6.0
Export demand (million tons):   1.5; 2.0; 2.5
Additional information: 3 million hectares (ha) are available for Crop X, the average yield of X is 5 tons/ha and the variable costs are R4000/ha. The estimated rental value of land (opportunity cost) is R500/ha.

5.2   Briefly explain how you would modify the mini-matrix to determine how much a monopoly agent would sell on each market to maximise revenue.   (2)