UNIVERSITY OF KWAZULU-NATAL
SCHOOL OF AGRICULTURAL, EARTH & ENVIRONMENTAL SCIENCES
DISCIPLINE OF AGRICULTURAL ECONOMICS
EXAMINATION: MAY/ JUNE 2012
SUBJECT, COURSE & CODE: AGRICULTURAL ECONOMICS 730, AGEC730

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

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NOTE: THIS PAPER CONSISTS OF 4 PAGES. PLEASE SEE THAT YOU HAVE THEM ALL.

ANSWER ALL QUESTIONS

QUESTION 1

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

1.1 LP models should not be applied to farm planning problems where decision-makers share resources. (3)

1.2 The following extract from an LP solution suggests that there is an alternative enterprise mix that will generate the same objective function value: (3)

VARIABLE	VALUE	REDUCED COST
MAIZE	0.00	0.00
SUNFLOWER	40.00	0.00
WHEAT	20.00	0.00

1.3 When Baumol's L criterion is used to identify a utility-maximising farm plan, its enterprises are selected on the basis of their expected gross margins, variation in their gross margins and covariance between their gross margins. (3)

1.4 LP models assume that production functions are linear with fixed input proportions and therefore cannot accommodate input substitution. (3)

1.5 When including the fixed cost of a new machine in a one-year Mixed Integer Programming (MIP) model, the fixed cost should be computed as the average annual cost of depreciation. (3)

1.6 LP models can be used to simulate market equilibrium by maximising producer surplus plus consumer surplus under a negative sloping demand function. (3)

1.7 Data Envelopment Analysis (DEA) only estimates relative efficiencies of farms. (3)

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QUESTION 2

2.1 Construct a step demand function for Land given the following extract from a LP solution for a one-year farm planning model:

ROW	SLACK OR SURPLUS	DUAL PRICES
Land	0.00	320.00

RANGES IN WHICH THE BASIS IS UNCHANGED:

		RIGHTHAND SIDE RANGES	
ROW	CURRENT RHS	ALLOWABLE INCREASE	ALLOWABLE DECREASE
Land	200.00	20.00	35.00

(2)

2.2 Given that Land is measured in hectares, does the ALLOWABLE INCREASE in Question 2.1 indicate that the optimal enterprise mix will change if farm size increased by more than 20 hectares? (1)

2.3 Would you advise the farmer to hire more land if the annual market rental rate is R280 per hectare? Why? (1)

2.4 Why would the DUAL PRICE of Land be zero if there was SURPLUS Land? Explain. (2)

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QUESTION 3

You have a beef herd of 100 animals. This herd requires at least 900 kg protein and 5000 kg TDN per day, while fibre is limited to a maximum of 800 kg per day. The protein, TDN and fibre can come from Lucerne hay, maize grain and soybean oilcake. One kg Lucerne hay supplies 0.2 kg protein, 0.5 kg TDN and 0.28 kg of fibre. One kg maize grain provides 0.1 kg protein, 0.8 kg TDN and 0.02 kg of fibre. One kg of soybean oilcake provides 0.35 kg protein and 0.7 kg TDN and 0.1 kg of fibre. Lucerne costs R1.50/kg, maize grain costs R2/kg and soybean oilcake costs R4/kg. Construct the LP cost minimization model matrix.

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QUESTION 3

Given the MOTAD model below, answer the following questions:

	Beetroot (ha)	Carrots (ha)	D1 (R)	D2 (R)	D3 (R)	RHS
Irrigated land (ha)	1	1				L 15
Labour (hrs)	150	250				L 6000
GM (R)	10000	15000				E X
GM Deviations:						
T1 (R)	-2000	3000	1			G 0
T2 (R)	3500	-5000		1		G 0
T3 (R)	-1500	2000			1	G 0
0.5TAD (R)			1	1	1	Min!

3.1 Explain how the MOTAD model above could be used to construct an E-V boundary. Do you think this analysis is useful for a farmer? Why? (5)

3.2 Reconstruct the MOTAD model in question 3.1 to maximise Baumol's $L=E-\theta\sigma$ criterion. (5)

3.3 Explain the advantages and disadvantages of these two models (i.e., MOTAD and Baumol) from a farm planning perspective. Which model would you chose and why? (7)

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QUESTION 5

Show how the LP model can simulate a free market situation (maximising society's welfare) using the following data for maize consumption and exports:

	Human consumption	**Animal consumption**	**Export**
Elasticity of demand	-0.5	-1.0	-20.0
Current consumption (million tons)	3.0	3.0	1.5
Current price (R per ton)	2100	1800	1500

Draw the appropriate matrix using the following three steps:

Human demand (million tons): 2.7; 3.0; 3.3

Animal demand (million tons): 2.5; 3.0; 3.5

Export (million tons): 0.5; 1.5; 2.5

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