

**UNIVERSITY OF KWAZULU-NATAL**  
**SCHOOL OF AGRICULTURAL, EARTH & ENVIRONMENTAL SCIENCES**  
**DISCIPLINE OF AGRICULTURAL ECONOMICS**  
**SUPPLEMENTARY EXAMINATION: JUNE/JULY 2013**  
**SUBJECT, COURSE & CODE: AGE750 RESEARCH METHODOLOGY &**  
**LINEAR PROGRAMMING**

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**DURATION: 3 HOURS**

**TOTAL MARKS: 100**

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**Internal Examiners:** Prof GF Ortmann, Dr E Wale and Mr MAG Darroch

**External Examiner:** Prof B Grove

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**NOTE: THIS PAPER CONSISTS OF 6 PAGES. PLEASE SEE THAT YOU HAVE THEM ALL.**

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**ANSWER SECTIONS A AND B IN SEPARATE BOOKS**

**SECTION A: RESEARCH METHODOLOGY**

Answer **ALL** Questions in this section.

**QUESTION 1**

Answer the following questions concisely and completely. Make sure that your answers are clear in flow and content. Use examples whenever necessary.

- 1.1. Suppose that you have reviewed a technical research report that was submitted to the National Research Foundation (NRF). In your review, you criticized the research project report noting that the analysis done does not adequately articulate on the relevant theory and establish the theoretical relationship(s) among the variables examined in the study. Why is economic theory considered important? How does economic theory affect your empirical model building, choice of data, data analysis and interpretation? Explain using one of the economic theories that you have been exposed to during your studies at UKZN. (5)
- 1.2. Suppose that UKZN has set up a research team to undertake a research project on HIV/Aids and farm labour. The team has decided to design a questionnaire and collect primary data. You are called upon to assist the team in the questionnaire design. What would be the mistakes you would advise them to avoid? Use examples where appropriate. (4)
- 1.3. Suppose you are reading a research report on youth unemployment in KwaZulu-Natal. The report finds that the province has the highest youth population and the highest level of youth unemployment. Based on this, the report concludes that population growth causes unemployment. Critically evaluate this conclusion. (3)

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- 1.4. A researcher wants to sample from the population such that gender and age groups are represented in proportion to their numbers within the population. Which sampling design would you suggest to use and why? (3)
- 1.5. Researchers always have to take secondary data cautiously. Elucidate this statement by enumerating and explaining the various points which you would consider before using any secondary data. Illustrate your answer using examples wherever possible. (4)
- 1.6. Most adoption studies suggest that younger farmers adopt a technology faster than older farmers. Suppose you were part of a research team for a study undertaken in KwaZulu-Natal. The results you found suggest that older farmers adopt a technology faster than younger farmers in KwaZulu-Natal. How would you approach the interpretation of this result? (4)
- 1.7. While studying at UKZN during the last 3 to 4 years, you have been exposed to a variety of empirical research methods for analysing data. In AGE750, it has been explained to you that you need to justify the choice of an empirical model. How would you choose an empirical model to analyse your data and how would you justify your choice considering different factors (criteria)? Explain, giving examples where necessary. (4)
- 1.8. Consider the following statement of a General Research Problem:
- “Are consumers in South Africa willing to pay a price premium for organic foods?”
- Develop, write-out and explain* a statement of a Specific Research Problem that you could study to help provide some of the knowledge needed to answer this question. (5)
- 1.9. “Specific Research Objectives state *what* is needed to achieve the General Objective, not *how* the General Objective is to be achieved.” Discuss this statement using examples to illustrate your thoughts. (4)

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**QUESTION 2**

Indicate whether the following statements are **TRUE** or **FALSE** and briefly motivate your answer:

- 2.1. Probability sampling designs are commonly applied in qualitative research as non-probability sampling designs are in quantitative research. (2)
- 2.2. Establishing the cause and effect relationship using economic theory enables a researcher to enhance internal validity. (2)
- 2.3. Structured questionnaires are commonly applied in qualitative research as unstructured questionnaires are in quantitative research. (2)
- 2.4. A sampling frame has to be free from any form of systematic omissions. (2)
- 2.5. “Unfortunately, 30% of small agribusinesses in South Africa go bankrupt each year” is a good example of the scientific language to use when defining a research problem. (3)
- 2.6. A well-developed Conceptual Framework uses economic theory as its capital stock to generate a set of testable hypotheses. (3)

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**SECTION B: LINEAR PROGRAMMING**

**ANSWER ALL QUESTIONS IN THIS SECTION**

**QUESTION 3**

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

3.1 The following transfer row is specified correctly:

	Potato growing (ha)	Potato selling (tons)	RHS
Potato transfer (tons)	-50	1	$\geq 0$

(3)

3.2 The DUAL PRICE of a resource constraint included in a LP model is zero only if the resource is fully utilised.

(2)

3.3 The VMP of a product included in a LP model can be computed by applying Euler's theorem.

(3)

3.4 LP models assume that production functions are linear with fixed input proportions and therefore cannot accommodate input substitution.

(3)

3.5 The Savage Regret or minimax criterion tends to identify very conservative farm plans because it assumes the worst state of nature.

(3)

3.6 Sequence constraints must be added to a MIP model to account for decreasing average costs.

(3)

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**QUESTION 4**

- 4.1 Construct a step demand function for LAND given the following information drawn from a farm planning LP solution: DUAL PRICE = R500, CURRENT RHS = 200ha, ALLOWABLE INCREASE = 100ha and ALLOWABLE DECREASE = 50ha. (3)
- 4.2 Would you say that the solution is sensitive to the amount of land available, and should the farmer hire more land if the market rental rate is R400/ha? (2)

[5]

**QUESTION 5**

Construct a LP model for a subsistence farm that you are planning for maximum gross margin given the following information:

- Land  $\leq 2.0$ ha.
- Capital  $\leq R6000$ .
- Two grain crops (A & B) can be grown using traditional (T) or modern (M) technology. Both are harvested during winter. The following table summarises the enterprise data:

	CropAT	CropAM	CropBT	CropBM
Variable costs (R/ha)	3000	4000	4000	5000
Yield (kg/ha)	3000	5000	3500	6000
Labour-summer (hrs/ha)	100	40	200	100
Labour-winter (hrs/ha)	100	120	100	120
Farm-gate price (R/kg)	2.00		3.00	
Retail grain price-winter (R/kg)	4.00			
Retail grain price-summer	5.00			

- Family farm labour (winter)  $\leq 150$  hrs; family farm labour (summer)  $\leq 200$  hrs.
- Crop A can be stored through winter and summer whereas Crop B can be stored only through winter. Chemicals used to preserve the crop in storage cost R0.50/kg per annum.
- Storage capacity is limited to a maximum of 500kgs of grain.
- Family grain consumption (summer)  $\geq 600$ kgs; family grain consumption (winter)  $\geq 700$ kgs.
- Family grain consumption is satisfied by production and/or grain bought in the retail market.

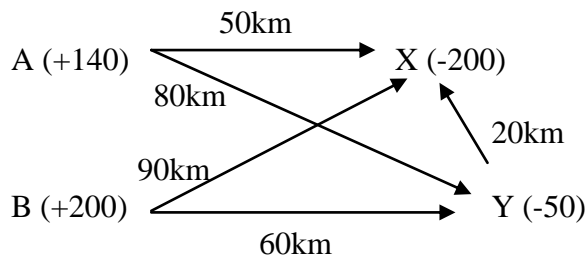
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**QUESTION 6**

A commodity must be transported from two surplus depots, A and B, to two deficit depots, X and Y. Transport costs equal R2/ton/km. The figure below shows distances along possible routes:



Construct a LP model to minimize transport costs.

[6]

**QUESTION 7**

7.1 Given the data below, construct a mini-matrix to show how Linear Programming can approximate a market equilibrium price for Crop A:

Crop A	Domestic market	Export market
Price elasticity of demand	-0.5	-10.0
Current consumption (million tons)	3.0	1.5
Current price (R/t)	1800	1500

Use the following quantity levels to segment consumer welfare in each market:

Domestic demand (million tons): 2.75; 3.00; 3.25  
 Export demand (million tons): 0.50; 1.50; 2.50

(10)

7.2 How you would modify the mini-matrix to determine how much a monopoly agent would sell on each market to maximise revenue? Explain briefly.

(2)

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