CHUKA UNIVERSITY

UNIVERSITY EXAMINATIONS
EXAMINATION FOR THE AWARD OF MASTER OF SCIENCE IN AGRIBUSINESS MANAGEMENT
AGEC 851: ECONOMETRIC METHODS

STREAMS: MSC AGBM **TIME:3 HOURS**
DAY/DATE: THURSDAY 07/08/2025 **8.30A.M. –11.30 A.M**

INSTRUCTIONS:

- Answer three questions
- Use appropriate examples from agricultural economics and rural development.
- Show your understanding of concepts, critical reasoning, and ability to apply models to real-world contexts.

Question One (20 Marks)

You are evaluating the impact of a government seed subsidy program on maize yields using observational survey data collected from 3 different agro-ecological zones.

a) Explain what endogeneity is, and describe two potential sources of endogeneity in this evaluation. **(4 marks)**
b) Propose a suitable instrumental variable and justify how it satisfies both relevance and exogeneity conditions. **(4 marks)**
c) Specify a Two-Stage Least Squares (2SLS) estimation strategy to assess the impact of the subsidy on yield. Provide both stages and explain your variables. **(6 marks)**
d) What are the main weaknesses or limitations of 2SLS in this context? Suggest an alternative quasi-experimental approach and explain why it may be preferable. **(6 marks)**

Question Two (20 Marks)

You are studying the effect of agricultural extension services on maize productivity over a 6-year panel of smallholder farmers.

a) Compare and contrast the assumptions and policy relevance of Fixed Effects and Random Effects models. When would each be preferred? **(6 marks)**

b) Explain how the Hausman test guides model selection between FE and RE. What would be the implication of choosing the wrong model? **(4 marks)**
c) Briefly outline a Dynamic Panel Data Model and explain the rationale for using System GMM. **(6 marks)**
d) Discuss one challenge in interpreting results from panel models in the context of agricultural productivity. **(4 marks)**

Question Three (20 Marks)

A study aims to understand farmers' choice between three technology packages: (i) no adoption, (ii) partial adoption, (iii) full adoption. The data also contains spatial coordinates for each farm.

a) Discuss the strengths and weaknesses of using an Ordered Logit/Probit model for this type of data. **(5 marks)**
b) When would a Multinomial Logit (MNL) model be preferred over an ordered model? What assumptions does it rely on? **(5 marks)**
c) Define and explain the Spatial Lag Model (SLM). Why might spatial dependence matter in this adoption decision? **(5 marks)**
d) Describe how you would construct a spatial weights matrix and test for spatial autocorrelation in adoption behavior. **(5 marks)**

Question Four (20 Marks)

Suppose you are analyzing the effect of temperature and rainfall variability on crop yields using 30 years of annual data.

a) Explain how you would test for stationarity and unit roots in the crop yield series. Why does this matter? **(4 marks)**
b) Define an ARIMA model and explain its components. When is it useful in agricultural forecasting? **(4 marks)**
c) What is the concept of cointegration? Specify and interpret a basic Error Correction Model (ECM) for climate-yield dynamics**.** **(6 marks)**
d) Briefly evaluate the potential advantages of using a Bayesian Structural Time-Series (BSTS) model over classical ARIMA for this problem. **(6 marks)**
