**CHUKA**  **UNIVERSITY**



**UNIVERSITY EXAMINATIONS**

**EXAMINATION FOR THE AWARD OF DEGREE OF MASTER OF AGRICULTURAL ECONOMICS**

**AGEC 841: AGRICULTURAL PRODUCTION ECONOMICS**

**STREAMS: MSC. AGEC** **TIME: 3 HOURS**

**DAY/DATE: MONDAY 14/04/2025** **2.30 P.M. – 5.30 P.M.**

**INSTRUCTIONS**

- **Answer question ONE and any other TWO**
- **Show all calculations for mathematical problems.**

**Question One**

a) Explain the Cobb-Douglas, CES, and Translog production functions, discussing their assumptions, properties, and practical applications in agricultural production. **(5 Marks)**

b) Given the Cobb-Douglas production function:

$$Q = AL^{\propto}K^{\beta}$$

Interpret the parameters $\alpha$ and $\beta$ in terms of returns to scale. **(5 Marks)**

c) Explain the differences between Stochastic Frontier Analysis (SFA) and Data Envelopment Analysis (DEA) in measuring efficiency. **(5 Marks)**

d) Differentiate between short-run and long-run cost functions, explaining the role of fixed and variable costs in each. **(5 Marks)**

**Question Two**

a) Define and derive the own-price elasticity of supply, explaining its significance in agricultural production. **(5 Marks)**

b) Discuss how supply response models can be used to analyze the effect of government policies on agricultural production. (5 Marks)

**c)** c) Differentiate between risk and uncertainty in agricultural production. Provide examples of each and explain their impact on farm decision-making. **(5 Marks)**

d) d) Explain three risk management strategies used in agricultural production and assess their effectiveness. **(5 Marks)**

**Question Three**

a) Define technical, allocative, and economic efficiency and discuss their relevance in production economics. **(5 Marks)**

b) Given the production function:

$$Q = Ae^{\lambda t}L^{\propto}K^{\beta}$$

**i.** Interpret the parameter $\lambda$ and discuss how it measures technical progress in production. **(3 Marks)**

ii. Empirically estimate factor shares in agricultural production using real-world data. **(4 Marks)**

c) The total cost function for a farm is given by:

$$TC=50+10Q-0.5Q^2+0.02Q^3$$

- Compute the Marginal Cost (MC), Average Cost (AC), and the profit-maximizing output level. **(8 Marks)**

**Question Four**

A farmer has 100 hectares of land and can grow wheat ($X_1$) and maize ($X_2$). The following constraints apply:

Land Constraint: $X1+X2\leq100$

Labor Constraint: $2X1+3X2\leq240$

Capital Constraint: $4X1+6X2\leq480$

Profit Function: Maximize $Z=500X_1+700X_2$

a) Formulate the linear programming model for this problem. **(5 Marks)**

b) Solve the model using simplex method to determine the optimal land allocation. **(10 Marks)**

c) Explain how shadow prices in LP models affect farm planning decisions. **(5 Marks)**

**Question Five**

A farm's production function is given by:

$$Q = 4L^{0.5}K^{0.5}$$

a) Derive the marginal products of labor and capital. **(5 Marks)**

b) Find the optimal combination of labor and capital if the farm aims to minimize costs, given that the wage rate is Sh. 10 per unit and the rental rate of capital is Sh. 20 per unit**. (5 Marks)**

c) Derive the inputs demands for labour and capital **(10 Marks)**

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