THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATIONS COUNCIL

ADVANCED CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

134/1 SCIENCE AND PRACTICE OF AGRICULTURE 1

(For Both School and Private Candidates)

Time: 2:30 Hours **ANSWERS** **Year: 2005**

Instructions

1. This paper consists of ten (10) questions in sections A, B and C.
2. Answer five (5) questions choosing at least one (1) question from each section.
3. Each question carries twenty (20) marks.
4. Cellura phones are not allowed in the examination room.
5. Write your Examination Number on every page of your answer booklet(s).

SECTION A

AGRICULTURAL ENGINEERING AND LAND PLANNING

1. (a) Compare the advantages of using solar energy versus wind energy on a farm.

   Solar energy has the advantage of being reliable in areas with abundant sunshine, which is common in many farming regions. It provides a steady source of power during daylight hours and is easy to install on rooftops or open land without moving parts, making maintenance low. Solar systems are also silent in operation and suitable for powering small farm equipment, lighting, and water pumps.

   Wind energy is advantageous in areas with strong and consistent winds, especially in open plains and coastal regions. It can generate power both day and night as long as wind is available, which complements solar energy. Wind systems can produce large amounts of electricity suitable for bigger farm operations, though they require more space and regular maintenance due to moving parts.

1. (b) (i) Describe the components of a solar power system.

   A solar power system consists of solar panels that capture sunlight and convert it into direct current electricity. These panels are usually mounted on rooftops or open fields where they receive maximum sunlight.

   The system also includes a charge controller, which regulates the flow of electricity from the panels to the batteries, preventing overcharging or deep discharge.

   Batteries are used to store electrical energy generated during the day for use at night or during cloudy periods.

   Wiring and mounting structures are included to connect and support the system safely and securely.

1. (b) (ii) State the function of an inverter.

An inverter converts direct current electricity from solar panels or batteries into alternating current electricity, which is suitable for operating most farm appliances and equipment.

2. (a) A rectangular grain store has a length of 10 metres and a width of 4 metres. If the grain is piled to a height of 2 metres, calculate the volume of the grain.

   Volume = length × width × height
   Volume = 10 × 4 × 2
   Volume = 80 cubic metres

2. (b) If 1 cubic metre holds 750 kg of grain, calculate the total mass of the grain in tonnes.

   Total mass = 80 × 750
   Total mass = 60,000 kg

   Since 1 tonne = 1,000 kg
   Total mass = 60,000 ÷ 1,000
   Total mass = 60 tonnes

3. (a) Explain the purpose of soldering in a farm workshop.

   Soldering is used in a farm workshop to join metal parts permanently using a low melting point metal called solder. It is commonly applied in electrical wiring, sheet metal work, and repair of small metal tools.

   The process ensures strong, conductive, and leak-proof joints, especially where welding is not suitable due to thin materials.

3. (b) (i) Name the tools used in soldering.

Tools used in soldering include a soldering iron, solder wire, flux, and a soldering stand.

3. (b) (ii) State the precautions to be taken when handling a hot soldering iron.

   A hot soldering iron should always be handled using its insulated handle to prevent burns.

   It should be placed on a stand when not in use, and the user should avoid touching the metal tip and keep flammable materials away.

4. (a) Define a theodolite.

   A theodolite is a precision surveying instrument used for measuring horizontal and vertical angles in land surveying and construction work.

4. (b) (i) Explain the use of a theodolite in land planning.

   A theodolite is used in land planning to measure angles accurately when setting out boundaries, roads, terraces, and building layouts.

   It helps in preparing accurate maps and ensuring proper alignment and positioning of farm structures.

4. (b) (ii) Describe how to level a theodolite.

   Levelling a theodolite involves setting the instrument on a tripod and adjusting the foot screws until the bubble in the spirit level is centered.

   This ensures that the instrument is perfectly horizontal before taking any measurements.

5. (a) Describe the construction requirements for a modern poultry house.

A modern poultry house should be constructed on well-drained land to prevent dampness and disease.

It must have adequate ventilation through windows or vents to allow fresh air circulation and removal of harmful gases.

The floor should be concrete or compacted earth for easy cleaning, and the roof should protect birds from rain and excessive heat.

5. (b) Discuss how temperature is controlled in a brooder house.

Temperature in a brooder house is controlled using heat sources such as electric bulbs, charcoal stoves, or gas brooders to keep chicks warm.

Ventilation is adjusted to prevent overheating while retaining enough warmth, and temperature is monitored using thermometers to ensure optimal conditions.

SECTION B
SOIL SCIENCE

6. (a) Outline the nitrogen cycle in the soil.

The nitrogen cycle begins with nitrogen fixation, where atmospheric nitrogen is converted into usable forms by bacteria or lightning.

Organic nitrogen from plant and animal residues is converted into ammonium through decomposition, a process known as ammonification.

Ammonium is converted into nitrates through nitrification, which plants can absorb.

Denitrification then converts nitrates back into atmospheric nitrogen, completing the cycle.

6. (b) (i) Define nitrification.

Nitrification is the biological process in which ammonium is converted into nitrites and then into nitrates by soil bacteria.

6. (b) (ii) Define denitrification.

   Denitrification is the process by which nitrates are converted into nitrogen gas under anaerobic soil conditions.

7. (a) Explain how the presence of organic matter affects soil temperature.

   Organic matter darkens the soil surface, allowing it to absorb more heat during the day.

   It also acts as an insulating layer, reducing rapid temperature fluctuations and protecting plant roots.

7. (b) (i) Name three sources of soil organic matter.

   Sources of soil organic matter include crop residues, animal manure, and decomposed plant litter.

7. (b) (ii) Describe the process of decomposition.

   Decomposition is the breakdown of organic materials by microorganisms into simpler substances.

   This process releases nutrients into the soil and contributes to the formation of humus.

8. (a) Explain the importance of phosphorus to plant growth.

   Phosphorus is essential for energy transfer in plants and plays a key role in root development and flowering.

   It also promotes early maturity and improves seed and fruit formation.

8. (b) (i) State the deficiency symptoms of phosphorus in crops.

Phosphorus deficiency causes stunted growth and poor root development.

Leaves may appear dark green or purplish, especially in young plants.

8. (b) (ii) Explain why phosphorus is often fixed in acidic soils.

In acidic soils, phosphorus reacts with iron and aluminium compounds to form insoluble complexes.

This makes phosphorus unavailable for plant uptake.

SECTION C
RURAL ECONOMY

9. (a) Define price elasticity of demand.

Price elasticity of demand is a measure of how responsive the quantity demanded of a product is to changes in its price.

9. (b) (i) Distinguish between elastic demand and inelastic demand.

Elastic demand occurs when a small change in price leads to a large change in quantity demanded.

Inelastic demand occurs when a change in price results in little or no change in quantity demanded.

9. (b) (ii) State two factors that determine the elasticity of demand for agricultural products.

Availability of substitutes affects elasticity because products with many substitutes are more elastic.

The nature of the product also matters, since necessities tend to have inelastic demand.

9. (c) The price of beans increases from Tshs 2,000 per kg to Tshs 2,400 per kg while the quantity demanded falls from 1,000 kg to 700 kg. Calculate the price elasticity of demand.

   Change in price = 2,400 − 2,000 = 400
   Average price = (2,400 + 2,000) ÷ 2 = 2,200

   Change in quantity = 700 − 1,000 = −300
   Average quantity = (700 + 1,000) ÷ 2 = 850

   Price elasticity of demand = (Change in quantity ÷ Average quantity) ÷ (Change in price ÷ Average price)

   Price elasticity of demand = (−300 ÷ 850) ÷ (400 ÷ 2,200)

   Price elasticity of demand = −0.3529 ÷ 0.1818

   Price elasticity of demand ≈ −1.94

   The demand is elastic in absolute terms.

9. (d) Explain why the demand for staple foods is usually inelastic.

   Staple foods are necessities that consumers must buy regardless of price changes.

   There are few close substitutes, so consumption does not change significantly when prices rise.

10. (a) Define a perfectly competitive market.

    A perfectly competitive market is a market structure where many buyers and sellers trade identical products and no single participant can influence the price.

10.(b) (i) State the characteristics of perfect competition.

There are many buyers and sellers in the market, and products are homogeneous.

Firms have free entry and exit, and buyers and sellers have perfect market information.

10.(b) (ii) Explain how price is determined in a perfectly competitive market.

Price is determined by the interaction of market demand and supply.

Individual sellers accept the market price because they are price takers.

10.(c) Describe the role of middlemen in the agricultural supply chain.

Middlemen collect produce from farmers and transport it to markets.

They also provide storage, grading, and sometimes credit services.

10.(d) Discuss how market information systems help farmers obtain better prices.

Market information systems provide farmers with up-to-date price data and demand trends.

This enables farmers to choose better markets and negotiate fair prices.