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: 2003**

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) Distinguish between primary tillage and secondary tillage.

   Primary tillage is the first major soil working operation carried out after land clearing. It involves deep cutting, loosening, and turning of the soil in order to break hard layers, bury weeds, and incorporate crop residues. Primary tillage prepares the land for further operations and improves soil aeration.

   Secondary tillage is the subsequent shallow soil working operation carried out after primary tillage. Its main purpose is to refine the seedbed by breaking large clods, leveling the soil surface, and controlling weeds to create favorable conditions for planting.

1. (b) (i) Describe the main parts of a mouldboard plough.

   The main parts of a mouldboard plough include the share, which cuts the soil horizontally at the required depth.

   The mouldboard is a curved metal surface that lifts, turns, and inverts the soil slice after it has been cut by the share.

   The landside is a flat metal plate that runs along the unploughed land and provides stability by resisting sideways pressure.

   The coulter is a sharp vertical knife or disc mounted ahead of the share to cut trash and soil vertically.

   The frog is the central base to which the share, mouldboard, and landside are fixed, ensuring correct alignment.

1. (b) (ii) State the functions of the coulter and the landside.

The coulter cuts through crop residues and soil vertically ahead of the share, ensuring a clean furrow and smooth ploughing operation.

The landside resists side pressure created during soil turning and keeps the plough moving in a straight line.

2. (a) A water pump delivers 300 litres of water per minute. Calculate the total volume of water pumped in cubic metres in 5 hours.

   Water delivered per minute is 300 litres.

   Total minutes in 5 hours = 5 × 60 = 300 minutes.

   Total water pumped = 300 × 300 = 90,000 litres.

   Since 1 cubic metre equals 1,000 litres, the volume pumped is 90,000 ÷ 1,000 = 90 cubic metres.

2. (b) State two factors that affect the efficiency of a water pump.

   The condition of pump components such as impellers and seals affects efficiency because worn parts reduce pumping capacity.

   The height through which water is lifted affects efficiency since higher lifting height requires more energy and reduces output.

3. (a) Classify metals into ferrous and non-ferrous metals.

   Ferrous metals are metals that contain iron as their main constituent and are usually magnetic.

   Non-ferrous metals are metals that do not contain iron and are generally resistant to rusting.

3. (b) (i) Give two examples of ferrous metals.

Examples of ferrous metals include cast iron and steel.

3. (b) (ii) State the properties of aluminium.

   Aluminium is light in weight, making it easy to handle and suitable for many farm tools.

   It is resistant to corrosion because it forms a protective oxide layer on its surface.

   Aluminium is also a good conductor of heat and electricity and is non-magnetic.

4. (a) Define a level line in surveying.

   A level line is an imaginary line that is horizontal at every point and is perpendicular to the direction of gravity.

4. (b) Describe the procedure used to set out a simple terrace using a line level.

   The line level is attached to a string stretched between two ranging poles placed on the slope.

   The poles are adjusted until the bubble of the line level is centered, indicating a horizontal line.

   Points along the slope are marked at this level position, and the process is repeated across the field to establish the terrace line.

5. (a) Name four types of farm fences.

   Four types of farm fences are barbed wire fence, live fence, electric fence, and wooden post fence.

5. (b) (i) Explain the use of a strainer post.

A strainer post is used at corners and ends of fences to support and tighten fence wires. It provides strength and prevents the fence from sagging.

5. (b) (ii) Describe the process of treating wooden posts against termite attack.

   Wooden posts are treated by dipping or brushing them with preservatives such as creosote or used engine oil.

   The treated posts are then dried before installation to improve resistance against termites and decay.

SECTION B
SOIL SCIENCE

6. (a) Explain the difference between hygroscopic water and capillary water.

   Hygroscopic water is water that is tightly held on the surface of soil particles and is not available to plants.

   Capillary water is held in small soil pores and can move by capillary action, making it readily available for plant use.

6. (b) (i) Define field capacity.

   Field capacity is the amount of water retained in the soil after excess gravitational water has drained away.

6. (b) (ii) Define permanent wilting point.

   Permanent wilting point is the soil moisture level at which plants can no longer extract water and permanently wilt.

7. (a) Explain the meaning of Cation Exchange Capacity (CEC).

Cation Exchange Capacity is the ability of soil to hold and exchange positively charged nutrient ions such as calcium, magnesium, and potassium.

7. (b) (i) Explain why clay soils have high CEC.

   Clay soils have high CEC because clay particles have large surface areas and negative charges that attract and hold cations.

7. (b) (ii) Explain how CEC influences fertilizer application.

   Soils with high CEC retain nutrients better, reducing fertilizer losses through leaching.

   Soils with low CEC require frequent fertilizer application in small amounts to avoid nutrient loss.

8. (a) Describe the three stages of water erosion.

   Sheet erosion occurs when a thin layer of topsoil is uniformly removed by runoff water.

   Rill erosion forms small channels on the soil surface as runoff concentrates.

   Gully erosion develops when rills enlarge into deep channels that cannot be removed by normal cultivation.

8. (b) Discuss the use of cover crops in controlling soil erosion on sloping land.

   Cover crops protect the soil surface from the direct impact of rainfall, reducing soil detachment.

   They slow down surface runoff, allowing more water to infiltrate into the soil and reducing erosion.

SECTION C

RURAL ECONOMY

9. (a) Define agricultural credit.

   Agricultural credit is borrowed money provided to farmers to finance farming operations and investments.

9. (b) (i) Distinguish between short-term credit and long-term credit.

   Short-term credit is borrowed for a short period, usually less than one year, to meet seasonal farming needs.

   Long-term credit is borrowed for several years to finance major investments such as machinery and buildings.

9. (b) (ii) State two sources of formal agricultural credit.

   Commercial banks provide loans to farmers under formal arrangements.

   Agricultural development banks offer credit specifically for farming activities.

9. (c) Explain the four Cs of credit: Character, Capacity, Capital, and Conditions.

   Character refers to the borrower's honesty and willingness to repay loans.

   Capacity is the borrower's ability to generate enough income to repay the loan.

   Capital refers to the borrower's own financial contribution to the investment.

   Conditions refer to external factors such as market prices and economic environment affecting repayment.

9. (d) Discuss the risks associated with borrowing money for farm investments.

Borrowed funds may increase financial pressure if farm income is low due to crop failure or price fluctuations.

High interest rates can increase repayment burden and reduce profitability.

10.(a) Define a farm balance sheet.

A farm balance sheet is a financial statement showing the value of farm assets, liabilities, and net worth at a specific time.

10.(b) (i) Distinguish between current assets and fixed assets.

Current assets are assets that can be converted into cash within a short period, such as cash and farm produce.

Fixed assets are long-term assets used in production, such as land, buildings, and machinery.

10.(b) (ii) Give three examples of farm liabilities.

Farm liabilities include bank loans, unpaid bills, and outstanding wages.

10.(c) A farmer owns cash worth Tshs 1,000,000, livestock worth Tshs 5,000,000, and machinery worth Tshs 8,000,000. The farmer owes the bank Tshs 3,000,000 and has unpaid bills of Tshs 500,000. Prepare a balance sheet and calculate net worth.

Total assets = 1,000,000 + 5,000,000 + 8,000,000 = Tshs 14,000,000.

Total liabilities = 3,000,000 + 500,000 = Tshs 3,500,000.

Net worth = Total assets − Total liabilities = 14,000,000 − 3,500,000 = Tshs 10,500,000.

10.(d) Discuss the importance of a balance sheet in assessing farm solvency.

A balance sheet shows whether a farm can meet its long-term financial obligations.

It helps farmers and lenders evaluate financial strength and creditworthiness.