**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: 2007**

## 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) Describe the differences between a disc plough and a disc harrow.

   A disc plough is a primary tillage implement designed to cut, lift, and turn the soil deeply. It consists of large concave discs that rotate individually and penetrate hard or trashy soils, making it suitable for virgin land and areas with heavy crop residues.

   A disc harrow is a secondary tillage implement used after ploughing to break soil clods, level the land, and prepare a fine seedbed. Its discs are smaller and arranged in gangs, and they do not invert the soil deeply like a disc plough.

1. (b) (i) State when a farmer would choose a disc plough over a mouldboard plough.

   A farmer would choose a disc plough when working on hard, dry, sticky, or virgin soils where a mouldboard plough cannot penetrate easily.

   It is also preferred in fields with heavy weeds or crop residues because the rotating discs cut through trash without clogging.

1. (b) (ii) Explain the function of the scraper on a disc.

   The scraper removes soil that sticks to the surface of the disc during operation.

   This ensures smooth rotation of the disc and maintains effective soil cutting and turning.

2. (a) A pulley with a diameter of 20 centimetres drives another pulley with a diameter of 10 centimetres. If the drive pulley rotates at 1,000 revolutions per minute, calculate the speed of the driven pulley.

   For belt-driven pulleys, speed is inversely proportional to diameter.

Speed of driven pulley = Speed of driver × Diameter of driver ÷ Diameter of driven

Speed of driven pulley = 1,000 × 20 ÷ 10

Speed of driven pulley = 2,000 revolutions per minute.

2. (b) Define velocity ratio.

   Velocity ratio is the ratio of the speed or distance moved by the driving machine to the speed or distance moved by the driven machine.

3. (a) State the safety rules to be observed when using a forge in a workshop.

   Protective clothing such as gloves, goggles, and aprons should be worn to prevent burns and eye injuries.

   Flammable materials should be kept away from the forge area to reduce the risk of fire.

   Tools should be handled carefully, and hot metals should be clearly identified to avoid accidental contact.

3. (b) (i) Name two tools used in forging.

   Tools used in forging include a hammer and an anvil.

3. (b) (ii) Describe the process of tempering steel.

   Tempering steel involves reheating hardened steel to a moderate temperature and then allowing it to cool slowly.

   This process reduces brittleness while retaining sufficient hardness, making the steel tougher and more durable for use.

4. (a) Define the term scale as used in surveying.

Scale is the ratio that shows the relationship between a distance on a map and the corresponding distance on the ground.

4. (b) (i) Convert a scale of 1:5,000 into a statement scale.

   A scale of 1:5,000 means that 1 unit on the map represents 5,000 units on the ground.

   Therefore, 1 centimetre on the map represents 5,000 centimetres, which is equal to 50 metres on the ground.

4. (b) (ii) If a distance on a map is 10 centimetres, calculate the actual ground distance in kilometres.

   Actual distance = 10 × 50 metres

   Actual distance = 500 metres

   Since 1 kilometre equals 1,000 metres, the distance is 0.5 kilometres.

5. (a) Explain the maintenance procedures for a knapsack sprayer.

   After use, the sprayer should be thoroughly cleaned with clean water to remove chemical residues that may corrode parts.

   The nozzle, filter, and hose should be checked and cleaned regularly to prevent blockage.

   Moving parts should be lubricated, and damaged components should be repaired or replaced promptly.

5. (b) Discuss the importance of calibration before using a sprayer.

   Calibration ensures that the correct amount of chemical is applied per unit area, preventing under-application or over-application.

Proper calibration improves effectiveness, reduces chemical wastage, and minimizes environmental pollution and crop damage.

## SECTION B

## SOIL SCIENCE

6. (a) Explain the USDA system of soil classification.

   The USDA system classifies soils based on their physical, chemical, and biological properties.

   It groups soils into hierarchical categories such as orders, suborders, great groups, subgroups, families, and series to aid in soil management and agricultural planning.

6. (b) (i) Define a soil order.

   A soil order is the highest and broadest category in the USDA soil classification system, grouping soils with similar formation processes and characteristics.

6. (b) (ii) Name two soil orders found in tropical regions.

   Soil orders found in tropical regions include Oxisols and Ultisols.

7. (a) Describe the procedure for taking a representative soil sample from a field.

   The field is first divided into uniform sections based on soil type and cropping history.

   Samples are then taken from several points in each section at the same depth and mixed thoroughly to form a composite sample.

7. (b) (i) State the tools used for soil sampling.

   Tools used for soil sampling include a soil auger and a spade.

7. (b) (ii) Explain why soil samples should not be taken near fence lines.

Soil near fence lines may be contaminated with manure, fertilizers, or animal waste, which can give misleading results.

8. (a) Define soil salinity.

Soil salinity is the accumulation of excessive soluble salts in the soil, which interferes with water uptake by plants.

8. (b) (i) Explain how irrigation can lead to soil salinity.

Irrigation water often contains dissolved salts, which accumulate in the soil when evaporation occurs and drainage is poor.

8. (b) (ii) Describe the method of leaching used to reclaim saline soils.

Leaching involves applying excess clean water to dissolve salts and move them below the root zone through drainage.

## SECTION C
## RURAL ECONOMY

9. (a) Define risk and uncertainty in farming.

Risk refers to situations where the probability of outcomes can be estimated, such as expected rainfall levels.

Uncertainty refers to situations where outcomes cannot be predicted or measured accurately, such as sudden market changes.

9. (b) (i) List three types of risks faced by farmers.

Farmers face production risks, market risks, and financial risks.

9. (b) (ii) Distinguish between risk and uncertainty.

Risk involves known probabilities, while uncertainty involves unknown probabilities.

9. (c) Describe three strategies used by farmers to reduce risk.

Farmers reduce risk by diversifying crops and enterprises to avoid total loss.

They use improved technologies such as irrigation and resistant varieties.

They also use forward contracts and savings to manage financial risks.

9. (d) Discuss the role of agricultural insurance in protecting farmers.

Agricultural insurance compensates farmers for losses caused by disasters such as droughts and floods.

It stabilizes farm income and encourages investment in modern farming methods.

10. (a) Define gross margin.

Gross margin is the difference between total revenue and total variable costs of a farm enterprise.

10. (b) (i) Distinguish between gross margin and net profit.

Gross margin considers only variable costs, while net profit accounts for both variable and fixed costs.

10. (b) (ii) State the formula for calculating gross margin.

Gross margin = Total revenue − Total variable costs.

10. (c) A farmer keeps 500 layers. Each bird produces 280 eggs per year. The price of one egg is Tshs 300 and the variable cost per bird per year is Tshs 40,000. Calculate the total gross margin for the enterprise.

Total eggs = 500 × 280 = 140,000 eggs.

Total revenue = 140,000 × 300 = Tshs 42,000,000.

Total variable cost = 500 × 40,000 = Tshs 20,000,000.

Gross margin = 42,000,000 − 20,000,000 = Tshs 22,000,000.

10. (d) Discuss how gross margin analysis can be used to choose between two competing farm enterprises.

Gross margin analysis helps farmers compare profitability by showing which enterprise generates higher returns per unit of resource used.

It guides decision-making by identifying enterprises that maximize income under limited resources.