**THE UNITED REPUBLIC OF TANZANIA**

**NATIONAL EXAMINATIONS COUNCIL OF TANZANIA**

**ADVANCED CERTIFICATE OF SECONDARY EDUCATION EXAMINATION**

**113/1 GEOGRAPHY 1**

(For Both School and Private Candidates)

**Time: 3 Hours** **ANSWERS** **Year: 1999**

**Instructions**

1. This paper consists of section A, and B with total of 13 questions.
2. Answer a total of five questions; two in section A, and three in questions in section B. Question number 1 is compulsory.

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*Prepared by: Maria Marco for TETEA*

1. Carefully study the map extract of BABATI (SERIES Y742) provided and answer the following questions.

(a) Calculate the area covered by plantation agriculture in square kilometers.

To calculate the area covered by plantation agriculture:
- Identify the plantation agriculture areas on the map.
- Measure their extent using a grid square method, where each square represents a known area based on the map scale.
- Count the full squares and estimate partial ones to determine the total area in square kilometers.

This calculation depends on precise measurement from the map extract.

(b) What is the length of the all-weather road with loose surface from Grid 930352 to Grid 040339 in kilometers?

To find the length of the road:
- Trace the road from Grid 930352 to Grid 040339.
- Measure the road's length using a ruler or a piece of string to follow curves.
- Convert the measured length using the map scale (e.g., 1 cm on the map might represent 0.5 km in reality).

The exact length depends on the scale used and road path measurement.

(c) Describe the relief of the area.

The relief of the area can be analyzed based on the contour lines, spot heights, and landforms present:
- Steep slopes are indicated by closely spaced contour lines, suggesting hilly or mountainous terrain.
- Gentle slopes have widely spaced contours, representing gradual elevation changes.
- Valleys and river courses are visible through V-shaped contour patterns, showing lower elevation points.
- Plateaus or flatlands appear in areas with minimal contour variation.
- If elevation data is provided, specific heights of landforms can be identified.

(d) Find the bearing from Grid 050400 to Grid 040350.

To determine the bearing:
- Identify the coordinates of both points on the map.
- Use a protractor to measure the angle clockwise from the north at Grid 050400 towards Grid 040350.
- The measured angle represents the true bearing between the two locations.

(e) Calculate the gradient from Grid 000315 to Grid 020320.

Gradient is calculated using the formula:

Gradient = Vertical Height Difference / Horizontal Distance

1. Determine the elevation at Grid 000315 and Grid 020320 from contour lines or spot heights.
2. Find the vertical height difference by subtracting the lower elevation from the higher elevation.
3. Measure the horizontal distance between the two points using the map scale.
4. Divide the height difference by the measured horizontal distance to obtain the gradient.

(f) With evidence suggest any three possible economic activities.

Economic activities in the area can be identified by analyzing land use, symbols, and key features on the map. Possible economic activities include:

- Agriculture. The presence of cultivated land, irrigation schemes, and settlements near fertile areas suggests farming as a major activity.
- Trade and commerce. Towns and road networks indicate markets and trading centers where goods and services are exchanged.
- Livestock keeping. Open lands and pastoral areas suggest cattle and goat rearing.
- Fishing. If the map has lakes, rivers, or fish-related symbols, fishing is likely an economic activity.
- Transportation. The presence of roads, railway lines, and airstrips supports employment in transport services.

2. (a) What is plane table survey?

Plane table surveying is a method of field surveying where observations and mapping are done simultaneously. A plane table is mounted on a tripod, and features are plotted directly onto paper based on sighting and measuring distances. This method is commonly used for small-scale surveys, such as topographical mapping and site plans.

(b) Outline the functions of instruments used in plane table survey.

The key instruments used in plane table surveying and their functions include:

- Plane table. A flat board used to mount the survey paper for direct plotting.
- Alidade. A sighting device used to take bearings and align features on the map.
- Tripod. Supports the plane table at a convenient height.
- Spirit level. Ensures the plane table is properly leveled.
- Compass. Determines the orientation of the plane table relative to the true north.
- Plumb bob. Helps in centering the table over a survey station.
- Measuring tape. Used for direct distance measurements when needed.

(c) Give advantages and disadvantages of plane table survey.
Advantages:
- Mapping and observation are done simultaneously, reducing fieldwork time.

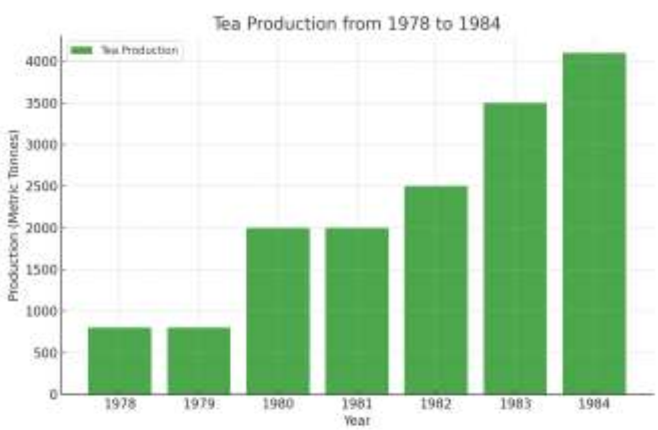
- Simple and cost-effective as it does not require complex equipment.
- Provides immediate results, making it useful for quick topographic surveys.
- Suitable for rough terrain where traditional surveying instruments are difficult to use.

Disadvantages:
- Less accurate than modern surveying methods like total stations and GPS.
- Requires stable weather conditions as wind or rain can disturb the setup.
- Not suitable for large-scale surveys due to limited precision.
- Errors in leveling the table can lead to inaccuracies in plotting.

3. The data below shows production of cash crops in metric tonnes (Hypothetical data).

| CROPS | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 |
|---|---|---|---|---|---|---|---|
| Tea | 800 | 800 | 2000 | 2000 | 2500 | 3500 | 4100 |
| Sisal | 3000 | 2500 | 2000 | 1000 | 1500 | 800 | 8 00 |
| Cotton | 1000 | 1800 | 2500 | 3000 | 3100 | 3500 | 4000 |

(a) Construct a divergent bar graph for tea.




(b) Comment on the trend of production.

- Tea production remained constant in 1978 and 1979 but increased significantly in 1980 and 1981.
- There was a steady rise in tea production from 1982 onwards, reaching its highest value in 1984.
- The trend indicates expansion in tea cultivation and possibly improved farming techniques or market demand.
- Sisal production shows a declining trend, possibly due to reduced market demand or land use changes.
- Cotton production shows a general upward trend, suggesting favorable conditions for its growth.

Overall, the data suggests increasing investment in tea and cotton farming, while sisal production faced a decline over time.

4. Carefully study the population pyramids of countries A and B given below and then answer the following questions.

(a) Describe the contrasting patterns of population structures in the two figures.

The population pyramids for countries A and B show distinct demographic patterns.

- Country A has a wide base and a narrow top, indicating a high birth rate and a high mortality rate. The majority of the population is concentrated in the younger age groups, with fewer people in older age brackets. This suggests a developing country with rapid population growth, high dependency ratios, and limited life expectancy.
- Country B has a more evenly distributed pyramid with a narrower base, meaning a lower birth rate. The population is more evenly spread across age groups, with a significant proportion of older individuals. This indicates a developed country with slow population growth, longer life expectancy, and a lower dependency ratio.

Overall, country A represents an expanding population, while country B shows a stable or declining population trend.

(b) What is the importance of each shape in the respective society?

The shape of a population pyramid provides insights into the social and economic structure of a society.

- The broad-based pyramid in country A suggests a high dependency ratio, where a large number of young people depend on a smaller working population. This can lead to challenges in providing education, healthcare, and employment opportunities. However, it also indicates a potential future workforce that could contribute to economic growth if managed properly.
- The more uniform shape of country B suggests a well-balanced population with a strong working-age group. This supports economic stability and allows for better social services such as healthcare and pensions. However, an aging population could lead to increased pressure on retirement benefits and healthcare systems in the long term.

Each shape reflects the demographic challenges and opportunities a country may face in planning for its future development.

5. "LANDFORM is the function of process, structure and stage." Discuss.

The development and characteristics of landforms are intricately linked to three fundamental factors: process, structure, and stage. This concept, often associated with William Morris Davis's geomorphic cycle theory, posits that the interplay of these elements dictates the evolution of Earth's surface features.

Process refers to the dynamic external forces, such as erosion, weathering, and deposition, that actively shape the landscape. These processes, driven by agents like water, wind, and ice, continuously modify



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landforms by wearing down elevated regions and filling in depressions. For instance, river erosion carves valleys, while wind deposition can create dune systems.

Structure pertains to the internal characteristics of the Earth's crust, including the composition, arrangement, and resistance of rock formations. The presence of faults, folds, and varying rock types influences how landforms respond to external processes. Resistant rock layers may form prominent ridges or escarpments, whereas softer strata are more susceptible to erosion, leading to valleys or basins. Thus, the geological framework sets the stage for differential erosion and landscape diversity.

Stage denotes the temporal aspect of landform development, reflecting the progression through various phases over geological time. According to Davis's model, landscapes evolve from a youthful stage, characterized by sharp relief and active downcutting, to a mature stage with well-developed drainage systems and reduced gradients, and finally to an old age stage, where the terrain is worn down to near sea level, forming peneplains. This temporal sequence illustrates how the cumulative effects of processes acting upon geological structures manifest in the observable morphology of landforms.

In summary, the morphology of any given landform is a product of the continuous interaction between external processes, the underlying geological structure, and the stage of development within the landscape's evolutionary timeline. Understanding this triadic relationship is essential for comprehending the complexities of Earth's topography.

6. Soil erosion is a product of human activities. Discuss.

While soil erosion is a natural process influenced by factors such as rainfall, wind, and topography, human activities have significantly accelerated its rate, leading to detrimental environmental impacts.

Agricultural practices are a primary contributor to enhanced soil erosion. Techniques like overgrazing, monoculture planting, and conventional tillage disturb the soil structure, reducing its cohesion and making it more susceptible to erosion by water and wind. For example, overgrazing by livestock removes protective vegetation cover, exposing soil to erosive forces. Similarly, intensive plowing disrupts soil aggregates, increasing the likelihood of erosion.

Deforestation also plays a critical role in soil degradation. The removal of trees eliminates root structures that stabilize the soil, while the absence of canopy cover allows raindrops to directly impact the soil surface, leading to increased runoff and erosion. This effect is particularly pronounced in tropical regions where slash-and-burn agriculture has led to significant soil loss and land degradation.

Urbanization contributes to soil erosion through the expansion of impermeable surfaces like roads and buildings. These surfaces prevent water infiltration, increasing surface runoff that can erode unprotected soils in surrounding areas. Construction activities further exacerbate the problem by disturbing soil and removing vegetation, leaving soils vulnerable to erosion.



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In summary, although natural factors initiate soil erosion, human activities have markedly intensified its occurrence. Unsustainable land-use practices, deforestation, and urban development disrupt natural soil protection mechanisms, leading to accelerated erosion rates and associated environmental challenges.

7. Give an account on the difference between Chemical and Physical Weathering.

Weathering encompasses the processes that break down rocks and minerals at Earth's surface, and it is broadly categorized into chemical and physical (mechanical) weathering, each with distinct mechanisms and outcomes.

Chemical weathering involves the alteration of the chemical composition of minerals within rocks, leading to their breakdown. This process is facilitated by reactions with atmospheric agents such as water, oxygen, carbon dioxide, and acids. Key types of chemical weathering include:

Hydrolysis: Reaction of minerals with water, leading to the formation of new minerals and soluble ions. For example, feldspar minerals hydrolyze to form clay minerals.

Oxidation: Reaction of minerals with oxygen, resulting in the formation of oxides. Iron-bearing minerals, for instance, oxidize to form iron oxides like hematite, giving rocks a reddish hue.

Carbonation: Reaction of minerals with carbonic acid (formed from water and carbon dioxide), leading to the dissolution of minerals such as calcite in limestone, which can create karst landscapes.

Physical weathering, in contrast, entails the mechanical breakdown of rocks into smaller fragments without altering their chemical composition. This process is driven by physical forces that induce stress within the rock. Major types include:

Frost wedging: Water enters cracks in rocks, freezes, and expands, exerting pressure that fractures the rock.

Thermal expansion: Fluctuations in temperature cause rocks to expand and contract, leading to the development of stress and eventual cracking.
Exfoliation: Removal of overlying material reduces pressure on rock surfaces, causing them to peel off in layers.

In essence, while chemical weathering transforms the mineralogical composition of rocks through chemical reactions, physical weathering disintegrates rocks into smaller pieces without changing their chemical properties. Both processes often act concurrently, with physical weathering increasing the surface area exposed to chemical agents, thereby enhancing chemical weathering.

8. Write short notes on any four of the following:

(a) Effects of soil erosion

Soil erosion has profound impacts on both the environment and human societies. The removal of the nutrient-rich topsoil layer diminishes soil fertility, leading to reduced agricultural productivity and potential food insecurity. Eroded soils can clog waterways, causing sedimentation that disrupts aquatic habitats and reduces water quality. Increased runoff due to erosion contributes to the siltation of reservoirs and rivers, reducing their capacity and increasing the risk of flooding. In severe cases, soil erosion can lead to land degradation and desertification, rendering land unproductive for future use.

(b) Blow hole

A blow hole is a coastal geomorphological feature formed when waves force water and air into a sea cave with an opening at the surface. The pressure created by the incoming waves forces water to spray out through the hole, resembling a geyser. Blow holes are commonly found along rocky coastlines where erosion by wave action has created tunnels or cavities. Over time, continuous erosion can enlarge the opening, making the blow hole more prominent. Examples of blow holes include the Kiama Blowhole in Australia and the Nakalele Blowhole in Hawaii.

(c) Flood plain

A flood plain is a flat, low-lying area adjacent to a river that is subject to periodic flooding. It is formed through the deposition of sediments carried by the river during overflows. The accumulation of alluvial deposits enriches the soil, making flood plains highly fertile and suitable for agriculture. However, these areas are also vulnerable to flood damage, especially in regions where deforestation and urbanization reduce natural water absorption. Prominent flood plains include those of the Nile, Ganges, and Mississippi rivers.

(d) Oxbow lake

An oxbow lake is a U-shaped water body formed from a meandering river that has been cut off from its main channel. This occurs when sediment deposition and erosion cause the river to change course, leaving behind an isolated section of water. Over time, the abandoned meander fills with water and becomes a lake. Oxbow lakes are common in floodplain environments and can eventually dry up due to sedimentation. Notable examples include Carter Lake in the United States and Lake Chicot in Arkansas.

9. Classify Igneous rocks.

Igneous rocks are classified based on their formation environment and mineral composition.

Extrusive Igneous Rocks

Extrusive rocks, also known as volcanic rocks, form when magma reaches the Earth's surface and cools rapidly. The rapid cooling results in fine-grained or glassy textures. Common examples include basalt, which is rich in iron and magnesium, and rhyolite, which has a high silica content. Volcanic glass, such as obsidian, forms when lava cools too quickly for crystals to develop.

Intrusive Igneous Rocks

Intrusive rocks, also known as plutonic rocks, form when magma cools slowly beneath the Earth's surface. The slow cooling process allows large crystals to develop. Granite, a common intrusive rock, is rich in quartz and feldspar, making it coarse-grained. Other examples include diorite and gabbro, which have different mineral compositions but similar coarse textures.

Classification by Composition
Igneous rocks are also classified based on their silica content.
Felsic rocks (e.g., granite and rhyolite) are rich in silica and light in color.
Intermediate rocks (e.g., diorite and andesite) have moderate silica content and are usually gray.

Mafic rocks (e.g., gabbro and basalt) are low in silica but rich in iron and magnesium, giving them a darker appearance.

Ultramafic rocks (e.g., peridotite) contain very little silica and are composed mainly of olivine and pyroxene.

10. Account for the Location of hot deserts and explain how plants are adapted to this hostile environment.

Hot deserts are primarily located along the Tropic of Cancer and the Tropic of Capricorn, roughly between latitudes 15° and 30° north and south of the equator. These regions experience high temperatures, low rainfall, and extreme aridity due to global atmospheric circulation patterns.

Location of Hot Deserts
Hot deserts occur in areas where descending air from the subtropical high-pressure zones inhibits cloud formation and precipitation. The Sahara Desert in Africa, the Arabian Desert in the Middle East, the Thar Desert in India, and the Australian Outback are examples of deserts influenced by these conditions. Coastal deserts like the Atacama in South America and the Namib in Africa are shaped by cold ocean currents that limit moisture availability.

Plant Adaptations in Hot Deserts
Plants in hot deserts have developed specialized adaptations to survive extreme heat and water scarcity. Succulents, such as cacti, store water in thick, fleshy tissues to sustain them during prolonged droughts. Many desert plants have deep root systems to access underground water or widespread shallow roots to quickly absorb surface moisture from infrequent rains. Some species, like the acacia tree, have small or waxy leaves to reduce water loss through transpiration. Others, such as desert ephemerals, complete their life cycle rapidly after rainfall to maximize survival opportunities. These adaptations allow vegetation to persist in the harsh desert environment.

11. Explain the source and importance of soil organic matter.

Source of Soil Organic Matter
Soil organic matter originates from decomposed plant and animal materials. Dead leaves, roots, crop residues, animal waste, and microbial biomass contribute to the organic content of the soil. The decomposition process, facilitated by bacteria, fungi, and other soil organisms, breaks down these materials into humus, which enriches the soil.

Importance of Soil Organic Matter
Soil organic matter plays a vital role in maintaining soil health and fertility. It improves soil structure by enhancing aggregation, reducing compaction, and increasing porosity, which promotes aeration and root growth. Organic matter enhances the soil’s water-holding capacity, making it more resilient to drought conditions. It also acts as a reservoir of essential nutrients, such as nitrogen, phosphorus, and potassium, which are gradually released to support plant growth. Additionally, soil organic matter supports microbial activity, contributing to nutrient cycling and improving soil biodiversity. In agricultural systems, maintaining adequate organic matter levels is crucial for sustaining crop yields and preventing soil degradation.

12. Discuss the Concept of graded profile of a river.
The graded profile of a river refers to the ideal longitudinal profile in which a river achieves a balance between erosion, transportation, and deposition, forming a smooth, concave shape from its source to its mouth. This concept was introduced by geomorphologist William Morris Davis as part of the fluvial cycle of erosion.

Characteristics of a Graded Profile
A graded river profile exhibits a gentle, concave slope with no sudden drops or irregularities. In this state, the river does not actively erode or deposit sediment excessively but maintains a stable equilibrium. This condition occurs when the river’s energy is just sufficient to transport its sediment load without significant erosion or deposition.

Stages in River Profile Development
In the upper course, rivers have steep gradients and strong erosive power, leading to deep valleys, waterfalls, and rapids. As the river enters the middle course, the gradient decreases, and lateral erosion becomes more dominant, leading to the development of meanders and floodplains. In the lower course, the river has a nearly flat gradient, resulting in significant deposition and the formation of deltas, levees, and estuaries.

Factors Influencing the Graded Profile
The achievement of a graded profile is influenced by factors such as tectonic activity, climate changes, base level variations, and human interventions like dam construction. Disruptions to this equilibrium can lead to rejuvenation, where increased erosion reshapes the river’s course and profile.
The concept of a graded profile helps in understanding river dynamics and the long-term evolution of fluvial landscapes, emphasizing the delicate balance between erosional and depositional processes.