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: 1998**

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.

1. Carefully study the Map Extract of HANANG (Series Y 742) provided and answer the following questions.

(a) Calculate the area of lake Balangida Gidaghangat and give your answer in square kilometers.

To determine the area of the lake:
- Identify the lake's boundaries on the map.
- Use the grid square method, where each square represents a known area based on the map scale.
- Count the full grid squares covered by the lake and estimate partial squares.
- Multiply the total number of squares by the area represented by each square to obtain the lake's size in square kilometers.

(b) Describe the relief and drainage of the area shown on the map.

The relief of the area can be interpreted using contour lines, spot heights, and landforms:
- Closely spaced contour lines indicate steep slopes and mountainous terrain.
- Widely spaced contour lines suggest gentle slopes or flat plains.
- The presence of peaks and ridges can be identified through elevation marks.
- Depressions or basins may exist if contour lines form closed loops with lower elevation values.

Drainage can be analyzed through rivers, streams, and water bodies:
- The presence of lakes and ponds suggests water accumulation in low-lying areas.
- Rivers and streams flowing in specific directions indicate the drainage pattern, such as dendritic, radial, or trellis patterns.
- The presence of swamps or marshes suggests poor drainage in some areas.

(c) Suggest any two possible economic activities carried out in the area shown on the map. Give evidence for your suggestion.

Economic activities in the area can be inferred from symbols and land use:
- Agriculture. The presence of cultivated fields and irrigation channels suggests crop farming.
- Fishing. The presence of lakes and rivers indicates fishing as a livelihood activity.
- Livestock keeping. Open land and pastoral areas suggest cattle and goat rearing.
- Trade and commerce. The existence of roads and market centers suggests business activities.
- Mining. If mineral symbols appear on the map, mining is a possible activity.

(d) State the vertical interval of the contours.

The vertical interval, or contour interval, represents the height difference between consecutive contour lines. It is determined from the map legend and typically varies based on the map scale and terrain type.

(e) How much time will a helicopter take to travel twenty times the distance from Grid 650150 to 750250 if it travels at a speed of 244 kilometers per hour?

To calculate time:
1. Measure the distance between Grid 650150 and 750250 using the map scale.
2. Multiply this distance by 20 to find the total travel distance.
3. Use the formula:

Time = Distance / Speed
where Speed = 244 km/h.

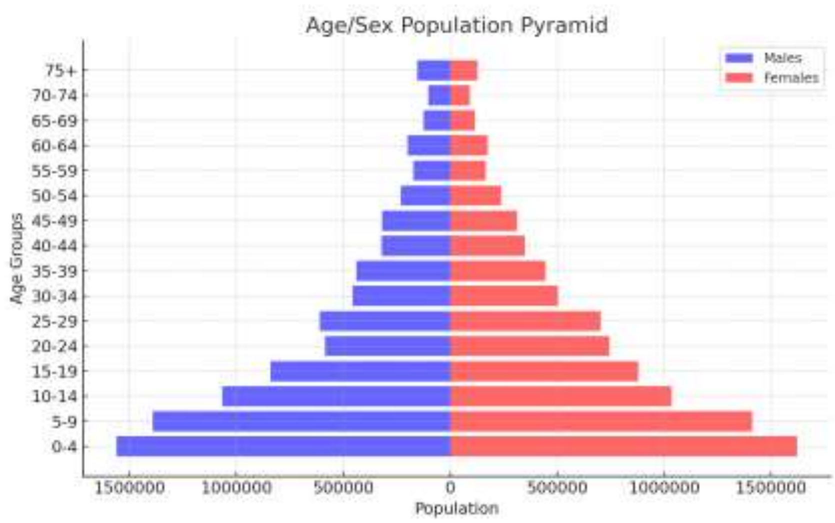
(f) Draw an annotated cross-profile from grid 705245 to 770245.

To draw the cross-profile:
- Identify contour lines along the section from 705245 to 770245.
- Plot elevation values against horizontal distance on graph paper.
- Draw a smooth curve representing the terrain along the section.
- Annotate key features such as peaks, valleys, rivers, and settlements.

2. Population of a certain country in Africa.

(a) Draw the age/sex pyramid to show population structure of this country.

The population pyramid should display age groups along the vertical axis and population size on the horizontal axis, divided into male and female categories.



(b) Comment on the population structure as shown by the graph you have drawn.

- A broad base indicates a high birth rate and youthful population.

- A narrow top suggests a short life expectancy and high mortality rates.
- If the middle portion is wider, it indicates a stable working-age population.
- Gender differences in some age groups may reflect migration patterns or social factors.

3. Discuss possible ways of reducing errors during compass surveying. What are the main disadvantages of compass survey?

Ways to reduce errors:
- Use a well-calibrated compass to ensure accurate readings.
- Take multiple readings and calculate an average to minimize mistakes.
- Avoid working near metallic objects or electric sources that can affect the compass needle.
- Use back bearings to confirm and correct directional errors.
- Ensure the compass is level and steady when taking measurements.

Disadvantages of compass survey:
- Affected by local magnetic variations and disturbances.
- Less accurate over long distances due to accumulated errors.
- Prone to human errors in reading and recording bearings.
- Limited usability in areas with dense vegetation or obstacles.

4. (a) Determine the focal length of the camera which shot an area 3900m above sea level mounted on an aircraft which stood at 6000m above the ground. Suggested scale of this photograph is 1:14000.

Focal length is determined using the scale formula:

Scale = Focal length / Flying height above the ground

Rearrange to find focal length:

Focal length = Scale x Flying height

Substituting the values:

Focal length = (1/14000) x 6000m

Focal length = 0.4286m or 428.6mm

(b) What are the disadvantages of air photographs over maps?
- Air photographs lack scale consistency, making distance measurement difficult.
- They do not provide labeled information, requiring interpretation by experts.
- Shadows and distortions can obscure details.
- Features may appear different due to perspective, leading to misinterpretation.
- Weather conditions such as clouds or haze can affect image clarity.

Despite these disadvantages, air photographs are useful for analyzing landscapes, urban planning, and environmental studies.

5. Factors Considered Important in Assessing Soil Fertility

Assessing soil fertility involves evaluating several key factors that determine the soil's capacity to support healthy plant growth.

Nutrient Content: Essential nutrients, including macronutrients like nitrogen (N), phosphorus (P), and potassium (K), as well as micronutrients such as iron, manganese, and zinc, are vital for plant development. The availability and balance of these nutrients in the soil directly influence crop yields and quality.

Soil pH: The acidity or alkalinity of soil, measured as pH, affects nutrient solubility and microbial activity. Most crops thrive in soils with a pH between 6.0 and 7.5. Deviations from this range can lead to nutrient deficiencies or toxicities, hindering plant growth.

Organic Matter Content: Organic matter, derived from decomposed plant and animal residues, enhances soil structure, water retention, and nutrient supply. It also supports a diverse microbial population, which plays a crucial role in nutrient cycling and disease suppression.

Soil Texture and Structure: The proportion of sand, silt, and clay particles determines soil texture, influencing water retention and drainage. Soil structure refers to the arrangement of these particles into aggregates, affecting root penetration and aeration. Optimal texture and structure facilitate efficient water and nutrient uptake by plants.

Moisture Availability: Adequate soil moisture is essential for nutrient dissolution and uptake by plant roots. Both excessive and insufficient moisture can impair plant growth and soil health. Proper irrigation and drainage practices help maintain optimal moisture levels.

Cation Exchange Capacity (CEC): CEC measures the soil's ability to hold and exchange positively charged ions (cations) like calcium, magnesium, and potassium. Soils with higher CEC can retain more nutrients, making them available for plant uptake over time.

Biological Activity: The presence and activity of soil organisms, including bacteria, fungi, earthworms, and insects, are indicators of soil health. These organisms decompose organic matter, enhance nutrient availability, and improve soil structure.

Evaluating these factors provides a comprehensive understanding of soil fertility, guiding effective management practices to optimize agricultural productivity.

6. Define Temperature, Lapse Rate, and Temperature Inversion. Account for Their Occurrence in the Atmosphere.

Temperature: Temperature is a measure of the average kinetic energy of the molecules in a substance, indicating how hot or cold the substance is. In the context of the atmosphere, it refers to the warmth or coolness of the air, which influences weather patterns, climate, and living conditions.

Lapse Rate: The lapse rate denotes the rate at which atmospheric temperature decreases with an increase in altitude. In the troposphere, the standard (or environmental) lapse rate averages about 6.5°C per kilometer ascent. This gradient occurs because air pressure and density decrease with altitude, causing air to expand and cool as it rises.

Temperature Inversion: A temperature inversion is a meteorological phenomenon where the typical lapse rate is reversed, and temperature increases with altitude over a specific layer of the atmosphere. This results in a warmer air layer overlaying a cooler one near the surface.

Occurrence in the Atmosphere:

Lapse Rate: Under normal conditions, solar radiation heats the Earth's surface, which in turn warms the air above it. As warm air rises, it expands due to lower pressure at higher altitudes and cools at the standard lapse rate. This process drives atmospheric convection, influencing weather systems and cloud formation.

Temperature Inversion: Inversions typically occur under specific conditions:

Radiational Cooling: During clear nights, the Earth's surface loses heat rapidly through radiation, cooling the air close to the ground. If a layer of warmer air moves in above this cooler air, an inversion forms.

Frontal Inversion: When a warm air mass overrides a cold air mass, the boundary between them can create an inversion layer.

Subsidence Inversion: Descending air in high-pressure systems compresses and warms. If this warm air settles over cooler surface air, it establishes an inversion.

Temperature inversions can lead to air quality issues, as they trap pollutants near the surface, preventing their dispersion. They also influence weather patterns by stabilizing the atmosphere, inhibiting convection and cloud formation.

7. Give an Account of Wave Erosional Features

Wave erosion is a powerful coastal process that shapes shorelines through the mechanical action of waves. This continuous interaction between waves and landforms results in distinctive erosional features:

Cliffs: Steep, vertical rock faces formed as waves erode the base of a coastline, causing the overlying material to collapse. Over time, the cliff retreats landward due to ongoing erosion.

Wave-Cut Platforms: As cliffs erode, they leave behind a flat, bench-like surface at the base, known as a wave-cut platform. This feature becomes exposed during low tide and indicates the former position of the cliff face.

Sea Arches: Erosion can create openings through headlands, forming natural arches. Continuous wave action enlarges these openings, eventually leading to the development of sea arches.

Sea Stacks: When the roof of a sea arch collapses, it leaves isolated, pillar-like structures called sea stacks. These remnants stand offshore, separated from the main coastline.

Caves: Waves exploit weaknesses such as joints or faults in coastal rocks, hollowing out chambers known as sea caves. These features can evolve into arches and stacks with continued erosion.

8. Evaluate the Factors and Effects of Earthquakes

Earthquakes result from the sudden release of energy within the Earth's crust, leading to ground shaking and various associated phenomena. Understanding the factors influencing earthquakes and their effects is crucial for assessing seismic hazards and implementing mitigation strategies.

Factors Influencing Earthquakes

Magnitude: The amount of energy released during an earthquake determines its magnitude. Higher magnitude earthquakes generally cause more extensive damage due to the greater energy involved.

Depth of Focus: The depth at which an earthquake originates, known as the focus, affects the intensity of ground shaking. Shallow-focus earthquakes typically produce more severe surface shaking compared to deeper ones.

Distance from Epicenter: The epicenter is the point on the Earth's surface directly above the earthquake's focus. Areas closer to the epicenter experience stronger shaking and, consequently, more significant damage.

Local Geology: The type of soil and rock in a region can amplify or dampen seismic waves. Soft soils may amplify shaking, leading to more damage, while hard bedrock can reduce wave amplification.

Building Design and Construction: Structures built with earthquake-resistant designs and materials are more likely to withstand seismic forces. In contrast, poorly constructed buildings are susceptible to collapse, increasing the risk of casualties.

Effects of Earthquakes

Ground Shaking: The primary effect of an earthquake is ground shaking, which can lead to structural damage or collapse of buildings, bridges, and other infrastructure.

Surface Rupture: Earthquakes can cause the Earth's surface to break along fault lines, displacing the ground horizontally or vertically. This can severely damage roads, pipelines, and buildings situated along the fault.

Soil Liquefaction: In water-saturated soils, intense shaking can cause the soil to behave like a liquid, leading to ground subsidence and the potential collapse of structures.

Landslides: Seismic activity in hilly or mountainous regions can trigger landslides, posing risks to communities and infrastructure.

Tsunamis: Undersea earthquakes can displace large volumes of water, generating tsunamis that can inundate coastal areas, causing widespread destruction.

Fires: Earthquakes may rupture gas lines or damage electrical infrastructure, leading to fires that can spread rapidly, especially if firefighting resources are compromised.

In summary, the impact of an earthquake is determined by a combination of natural factors and human elements. Mitigating these effects requires comprehensive planning, adherence to building codes, public education, and the development of early warning systems.

9. Examine the Drainage Systems Directly Controlled by Tectonic Forces

Tectonic forces, resulting from the movement and interaction of Earth's lithospheric plates, play a pivotal role in shaping drainage systems. These forces influence the orientation, pattern, and evolution of river networks through processes such as uplift, subsidence, and faulting.

Antecedent Drainage Systems

Antecedent rivers maintain their original course despite tectonic uplift. As the land rises due to tectonic activity, the river's erosive power cuts through the uplifting terrain, forming deep gorges or canyons. The

Indus River in the Himalayas exemplifies this, as it has carved deep valleys while the mountain range continues to uplift.

Consequent Drainage Systems

Consequent rivers develop their courses in direct response to the initial slope of the land, often influenced by recent tectonic activities. These rivers flow down the gradient created by tectonic uplift or tilting. For instance, rivers flowing from the uplifted blocks of faulted terrains typically follow paths determined by the new topography.

Drainage Patterns Influenced by Tectonics

Rectangular Drainage Pattern: This pattern emerges in regions where faulting has created a network of fractures intersecting at right angles. Rivers and streams exploit these lines of weakness, resulting in a drainage system with right-angle bends.

Trellis Drainage Pattern: Characteristic of folded terrains, such as those found in regions with alternating hard and soft rock strata, this pattern features main rivers running parallel to fold axes, with tributaries joining at near right angles.

Radial Drainage Pattern: Developing around centrally uplifted areas like domes or volcanic cones, rivers radiate outward from the central high point. Mount Fuji in Japan showcases such a pattern, with streams flowing outward in all directions from the volcanic peak.

In summary, tectonic forces significantly influence the configuration and evolution of drainage systems. By dictating land elevation and structural features, these forces determine the pathways rivers take, leading to diverse drainage patterns observable across the globe.

10. "The Coastal Zone is Undergoing Constant Changes." Discuss.

Coastal zones represent dynamic interfaces between terrestrial and marine environments, subject to continuous changes driven by natural processes and human activities.

Natural Processes

Wave Action: Waves constantly erode, transport, and deposit sediments along coastlines, reshaping features such as beaches, cliffs, and sandbars. The energy and direction of prevailing waves influence the rate and nature of these changes.

Tidal Movements: Tides contribute to the regular inundation and exposure of coastal areas, affecting sediment distribution and coastal ecology. Tidal currents can erode channels and deposit sediments, altering the coastal landscape over time.

Sea-Level Changes: Fluctuations in sea levels, whether due to climatic variations or geological events, can lead to the submergence or emergence of coastal lands. Rising sea levels, for instance, can inundate low-lying areas, while falling levels can expose new landforms.

Weather Events: Storms and hurricanes bring intense wave action and storm surges, leading to rapid and sometimes drastic alterations of the coastline through erosion and overwash processes.

11. Explain how the Mediterranean vegetation is adapted to the climatic conditions in which they thrive.

Mediterranean vegetation is uniquely adapted to survive in the hot, dry summers and mild, wet winters characteristic of Mediterranean climates. The adaptation strategies of plants in this biome focus on water conservation, resistance to drought, and protection from fire.

Drought Resistance and Water Conservation
Many Mediterranean plants have developed xerophytic features to cope with prolonged summer droughts. Evergreen trees such as olive (Olea europaea) and cork oak (Quercus suber) have small, thick, waxy leaves that minimize water loss through transpiration. Shrubs like rosemary and lavender have deep root systems that enable them to access underground moisture even during dry periods. Some species store water in thick, succulent stems or leaves, as seen in certain cacti and euphorbias.

Fire Adaptation
Wildfires are common in Mediterranean regions, particularly during the dry summer months. Many plants have evolved fire-resistant features or the ability to regenerate quickly after fires. Some trees, like the cork oak, have thick, fire-resistant bark that protects their inner tissues. Other species, such as the Aleppo pine, have serotinous cones that require fire to open and release seeds, ensuring regeneration after a fire event.

Seasonal Growth Patterns
Mediterranean vegetation is adapted to take advantage of the wet winter season for growth while becoming dormant during the summer to conserve resources. Deciduous trees shed their leaves in summer to reduce water loss, while perennial shrubs and herbs grow rapidly during cooler months before entering dormancy in the dry season.

Adaptation to Nutrient-Poor Soils
Mediterranean soils are often rocky and nutrient-deficient, yet plants have adapted by developing symbiotic relationships with nitrogen-fixing bacteria and mycorrhizal fungi, which enhance nutrient uptake. Some plants, like legumes, improve soil fertility through nitrogen fixation.
Wind and Salt Tolerance

Since Mediterranean regions include coastal areas, many plants have adaptations to withstand strong winds and salt spray. Coastal vegetation such as tamarisk and sea lavender have tough, salt-tolerant leaves that prevent dehydration. Low-growing shrubs with deep roots provide stability against wind erosion.

12. What are the main types of river regimes? Explain the factors which affect river regimes.

A river regime refers to the seasonal variations in the volume and discharge of a river over the course of a year. River regimes are influenced by climatic, geological, and human factors that affect water availability and flow patterns.

Main Types of River Regimes

Simple (Monomodal) River Regime: A simple river regime is characterized by a single peak of high discharge and a single period of low flow each year. This type is typical of rivers in regions with distinct wet and dry seasons, such as the Nile River in Egypt, which peaks during the summer due to rainfall in its upstream regions.

Complex (Polymodal) River Regime: A complex river regime features multiple peaks and fluctuations in discharge throughout the year. This occurs in rivers that receive water from multiple sources, such as rainfall, snowmelt, and glaciers. The Amazon River, for example, experiences variations due to rainfall across different tributary basins.

Factors Affecting River Regimes

Climate and Precipitation

The amount, intensity, and seasonal distribution of precipitation directly influence a river's discharge. Rivers in tropical regions, like the Congo River, experience continuous high discharge due to year-round rainfall. In contrast, rivers in temperate or monsoon climates have distinct seasonal variations in flow. Snow-fed rivers, such as the Indus, experience peak discharge during spring and summer when snowmelt occurs.

Geology and Soil Characteristics

The nature of the underlying rocks and soils affects water infiltration and runoff. Permeable rocks, such as limestone and sandstone, allow water to percolate, leading to lower surface runoff and more stable river flow. In contrast, impermeable surfaces, such as clay soils, enhance surface runoff, causing more pronounced seasonal variations in river discharge.

Topography and Drainage Basin Shape

The slope of the land and the shape of the drainage basin influence how quickly water reaches the river. Steep terrains promote rapid runoff and short-lived peak flows, while flat landscapes allow water to move slowly, moderating discharge variations. Larger drainage basins with multiple tributaries tend to have more complex river regimes compared to small, single-source rivers.

Vegetation Cover

Forests and vegetation act as natural water regulators by absorbing rainfall and reducing runoff. In well-vegetated areas, water infiltrates the soil, replenishing groundwater and maintaining river flow during dry seasons. Deforestation, however, increases runoff and enhances seasonal fluctuations in river discharge.

Human Activities

Human interventions such as dam construction, irrigation, and urbanization significantly alter river regimes. Dams regulate discharge by storing water during wet periods and releasing it during dry periods. Large-scale irrigation can reduce river flow by diverting water for agricultural use, while urbanization increases surface runoff due to the presence of impermeable surfaces.