

The  
Management  
University  
of Africa



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**UNDERGRADUATE UNIVERSITY EXAMINATIONS**

**SCHOOL OF MANAGEMENT AND LEADERSHIP**

**DEGREE OF BACHELOR OF EDUCATION ARTS**

**GEO 223:     TECHNIQUES IN GEOGRAPHY III: STATISTICAL METHODS**

**DATE:         2<sup>ND</sup> APRIL 2026**

**DURATION:    2 HOURS**

**MAXIMUM MARKS: 70**

**INSTRUCTIONS:**

1. Write your registration number on the answer booklet.
2. **DO NOT** write on this question paper.
3. This paper contains **SIX (6)** questions.
4. Question **ONE** is compulsory.
5. Answer any other **THREE** questions.
6. Question **ONE** carries **25 MARKS** and the rest carry **15 MARKS** each.
7. **Write all your answers in the Examination answer booklet provided.**

## QUESTION ONE

**Read the Case Study below carefully and answer the questions that follow:**

### REMOTE SENSING

Remote sensing is the acquisition of information about an object or phenomenon without making physical contact with the object, in contrast to in situ or on-site observation. The term is applied especially to acquiring information about Earth and other planets. Remote sensing is used in numerous fields, including geophysics, geography, land surveying and most Earth science disciplines (e.g. exploration geophysics, hydrology, ecology, meteorology, oceanography, glaciology, geology). It also has military, intelligence, commercial, economic, planning, and humanitarian applications, among others.

In current usage, the term *remote sensing* generally refers to the use of satellite- or aircraft-based sensor technologies to detect and classify objects on Earth. It includes the surface and the atmosphere and oceans, based on propagated signals (e.g. electromagnetic radiation). It may be split into "active" remote sensing (when a signal is emitted by a satellite or aircraft to the object and its reflection is detected by the sensor) and "passive" remote sensing (when the reflection of sunlight is detected by the sensor). Remote sensing can be divided into two types of methods: *Passive remote sensing* and *Active remote sensing*. Passive sensors gather radiation that is emitted or reflected by the object or surrounding areas. Reflected sunlight is the most common source of radiation measured by passive sensors. Examples of passive remote sensors include film photography, infrared, charge-coupled devices, and radiometers.

Active collection, on the other hand, emits energy in order to scan objects and areas whereupon a sensor then detects and measures the radiation that is reflected or backscattered from the target. RADAR and LiDAR are examples of active remote sensing where the time delay between emission and return is measured, establishing the location, speed and direction of an object. Remote sensing makes it possible to collect data of dangerous or inaccessible areas. Remote sensing applications include

monitoring deforestation in areas such as the Amazon Basin, glacial features in Arctic and Antarctic regions, and depth sounding of coastal and ocean depths. Military collection during the Cold War made use of stand-off collection of data about dangerous border areas. Remote sensing also replaces costly and slow data collection on the ground, ensuring in the process that areas or objects are not disturbed.

Orbital platforms collect and transmit data from different parts of the electromagnetic spectrum, which in conjunction with larger scale aerial or ground-based sensing and analysis provides researchers with enough information to monitor trends such as El Niño and other natural long and short term phenomena. Other uses include different areas of the earth sciences such as natural resource management, agricultural fields such as land usage and conservation, greenhouse gas monitoring, oil spill detection and monitoring, and national security and overhead, ground-based and stand-off collection on border areas. Conventional radar is mostly associated with aerial traffic control, early warning, and certain large-scale meteorological data.

Doppler radar is used by local law enforcements' monitoring of speed limits and in enhanced meteorological collection such as wind speed and direction within weather systems in addition to precipitation location and intensity. Other types of active collection include plasmas in the ionosphere. Interferometric synthetic aperture radar is used to produce precise digital elevation models of large scale terrain (RADARSAT, TerraSAR-X, and Magellan). Laser and radar altimeters on satellites have provided a wide range of data. By measuring the bulges of water caused by gravity, they map features on the seafloor to a resolution of a mile or so. By measuring the height and wavelength of ocean waves, the altimeters measure wind speeds and direction, and surface ocean currents and directions. Ultrasound (acoustic) and radar tide gauges measure sea level, tides and wave direction in coastal and offshore tide gauges.

Light detection and ranging (LIDAR) is used for weapon ranging, laser illuminated homing of projectiles, and to detect and measure the concentration of various

chemicals in the atmosphere while airborne LIDAR can be used to measure the heights of objects and features on the ground more accurately than radar technology. LIDAR can be used to detect ground surface changes. Vegetation remote sensing is a principal application of LIDAR.

Radiometers and photometers are the most common instrument in use, collecting reflected and emitted radiation in a wide range of frequencies. The most common are visible and infrared sensors, followed by microwave, gamma-ray, and rarely, ultraviolet. They may also be used to detect the emission spectra of various chemicals, providing data on chemical concentrations in the atmosphere.

**Required:**

- a) Using proper examples, distinguish between descriptive and inferential statistics. **(5 marks)**
- b) A researcher obtained the following data set on students' C.A.T marked out of 15.  
10,14,12,8,9,7,8,10,9,8,12,10,6,7,8  
From the data above, calculate
  - i. Variance **(6 marks)**
  - ii. Standard deviation **(4 marks)**
- c) Analyze **five** importance of remote sensing in modern day living. **(5 marks)**
- d) Examine the concept of remote sensing. **(5 marks)**

**QUESTION TWO**

- a) Distinguish between active and passive sensors. **(5 marks)**
- b) Analyze **five** steps in remote sensing. **(10 marks)**

**QUESTION THREE**

- a) Evaluate **five** sources of weather and climate data for any country. **(5 marks)**
- b) Evaluate **five** principles of remote sensing. **(10 marks)**

**QUESTION FOUR**

- a) Evaluate **five** advantages of using the mean in geographic studies. **(5 marks)**
- b) Examine **five** factors which make aerial photography different from remote sensing imagery. **(10 marks)**

**QUESTION FIVE**

- a) Analyze **five** roles played by statistics in daily life **(5 marks)**
- b) Assess **five** applications of remote sensing. **(10 marks)**

**QUESTION SIX**

- a) Distinguish between random and purposeful sampling methods. **(5 marks)**
- b) Explore the application of any **five** remote sensing platforms. **(10 marks)**