



GWANDA STATE UNIVERSITY

FACULTY OF ENGINEERING AND ENVIRONMENT

DEPARTMENT OF GEOMATICS AND SURVEYING

ADJUSTMENT COMPUTATIONS 1

ESG 2209

Examination Paper

April 2025

This examination paper consists of 3 pages

Time Allowed: 3 hours

Total Marks: 100

Examiner: F. Shumba

INSTRUCTIONS

Calculator is required

Answer all questions

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QUESTION 1

Define the following terms include formulas and diagrams.

- i. Standard deviation
- ii. Absolute Error
- iii. Direct Measurement
- iv. Residual
- v. Most probable value
- vi. Covariance
- vii. Precision
- viii. Indirect Measurement
- ix. Accuracy
- x. Confidence Interval

25 Marks.

QUESTION 2

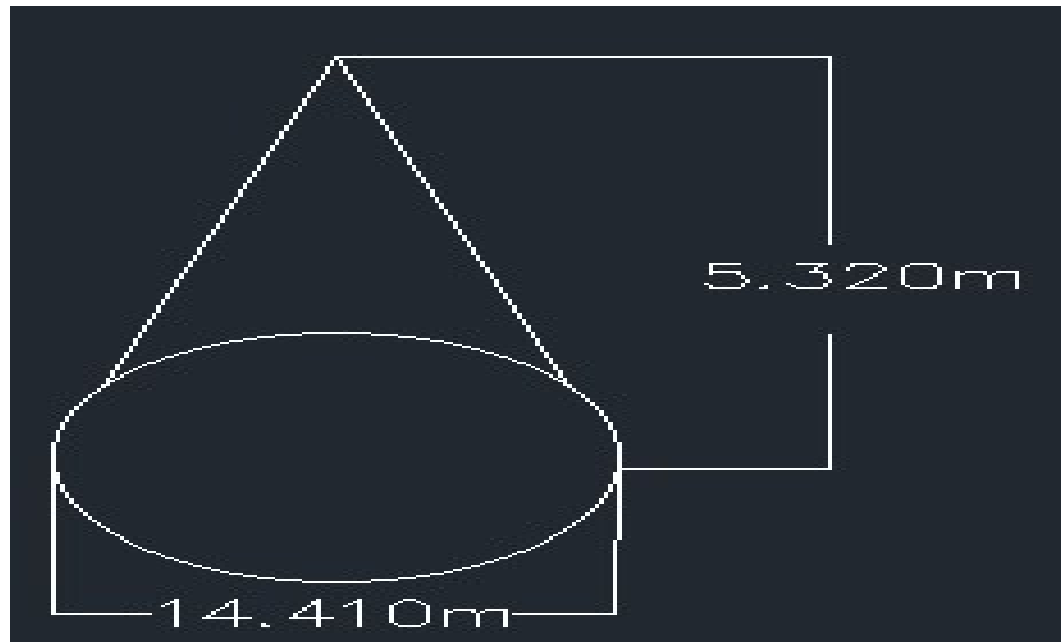
Derive the variance covariance matrix of y where $y = a_1x_1 - a_2x_2 + a_3x_3$.

Illustrate for both GLOPOV and SLOPOV

25 Marks

QUESTION 3

- i. The Picture below shows a conical pile of Quarry Stones. Calculate the Volume of the pile and the tolerance? The distances were measured with a tape measure with an accuracy of $\pm 0.007\text{m}$.



QUESTION 4

- i. Derive from first principles the Least Squares solution?

$$x - y = 3.0$$

$$2x + y = 1.5$$

$$x + y = 0.2$$

25 MARKS

THE END
