GWANDA STATE UNIVERSITY

FACULTY OF ENGINEERING AND ENVIRONMENT

DEPARTMENT OF GEOMATICS AND SURVEYING

ADJUSTMENT COMPUTATIONS 1

ESG 2209

Examination Paper

June 2026

This examination paper consists of 2 pages

Time Allowed: **3 hours**

Total Marks: **100**

Examiner: **F. Shumba**

INSTRUCTIONS

Calculator is required

Answer all questions

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QUESTION 1

i. Define indirect observations. 5 marks

ii. Write the observation equation. 5 marks

iii. Explain the steps involved in least squares adjustment of indirect observations. 10 marks

iv. Give TWO examples from surveying practice. 5 marks

QUESTION 2

$x = 150 \pm 0.04$ m

$y = 75 \pm 0.03\,m$

i. State the law of error propagation. 5 marks

ii. Compute the standard deviation of:- $d = \sqrt{(x^2 + y^2)}$ 15 marks

iii. Comment on the effect of measurement precision on derived quantities. 5 marks

QUESTION 3

Calculate the most probable values for A and B in the equations below by the method of least squares. Consider the observations to be of equal weight.

$3A + 2B = 7.80 + v_1$

$2A - 3B = 5.55 + v_2$

$6A - 7B = 8.50 + v_3$

QUESTION 4

After adjusting a network, the following were obtained:

$v^T W v = 0.036$, n=10, u=4

i. Compute the variance of unit weight. 10 marks

ii. Explain the significance of this value. 10 marks

iii. State ONE criterion for a good surveying network. 5 marks

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THE END