FACULTY OF ENGINEERING AND THE ENVIRONMENT

BACHELOR OF SCIENCE (HONORS) DEGREE IN GEOMATICS AND SURVEYING

ADJUSTMENT COMPUTATIONS II

MODULE CODE: ESG 3209

EXAMINATIONS JUNE 2026

DURATION: 3 HOURS

EXAMINER: T.T. MAKONI

INSTRUCTIONS:

ANSWER ALL FOUR (4) QUESTIONS

EACH QUESTION CARRIES 25 MARKS

STATISTICAL TABLES

USE OF CALCULATORS BUT PROGRAMMEBLE CALCULATORS ARE NOT ALLOWED

QUESTION 1

The seconds' portion of 50 pointings and readings for a particular direction made using a 1 *second* total station with a 0.1 *second* display are

26.7, 26.4, 24.8, 27.4, 25.8, 27.0, 26.3, 27.8, 26.7, 26.0, 25.9, 25.4, 28.0, 27.2, 25.3, 27.2, 27.0, 27.7, 27.3, 24.8, 26.7, 25.3, 26.9, 25.5, 27.4, 25.4, 25.8, 25.5, 27.4, 27.2, 27.1, 27.4, 26.6, 26.2, 26.3, 25.3, 25.1, 27.3, 27.3, 28.1, 27.4, 27.2, 27.2, 26.4, 28.2, 25.5, 26.5, 25.9, 26.1, 26.3

(a) What is the mean of the data set? [4]

(b) Construct a frequency histogram of the data using seven uniform width class intervals. [5]

(c) What are the variance and standard deviation of the data? [6]

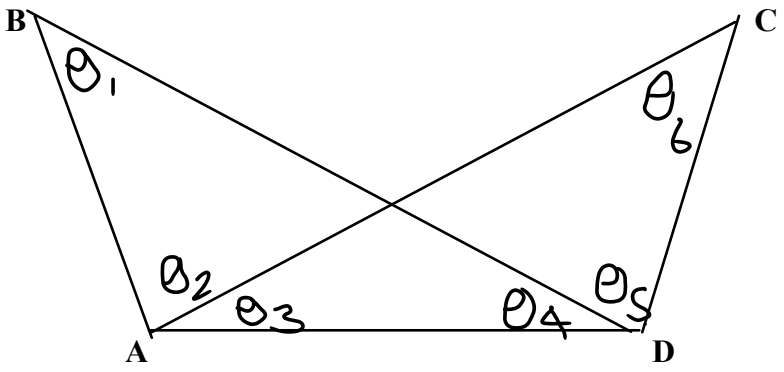
(d) What is the standard deviation of the mean? [4]

(e) Differentiate between point estimate and interval estimate? [4]

(e) What do you understand by the term discrepancy of data? [2]

QUESTION 2

Find the most probable values of the observed angles of a triangulation network.



[25]

QUESTION 3

a) Describe the five elements of a hypothesis test. [5]

b) An angle is measured 10 times. Each measurement is independent and made with the same precision. The sample standard deviation is s= 7.3". Test at a significance level of 5% the hypothesis that the population standard deviation δ of the measurement is 2.0 against the alternative that δ is not 20". [5]

c) The sample mean of the 20 independent measurements of a distance was found to be 537.615m

i.) If the standard deviation of each measurement is known to be 0.033m, construct a 95% confidence interval for the population mean μ. [5]

ii.) If the sample standard deviation is calculated to be 0.035m, construct a 95% confidence interval for the population mean. [5]

iii.) Construct a 95% confidence interval of δ^2 and the corresponding confidence interval for δ if the sample standard deviation is calculated to be 0.035m. [5]

QUESTION 4

Linear Model of observation equation method of Least squares uses the relationship below, find the parameters m and c (LSE) of the functional relationship by Least Squares, then perform a post analysis on the result.

x	1	3	3	4
y	2	3	4	4

[25]