NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY

DEPARTMENT OF CIVL MINING AND PROCESS ENGINEERING

QUALIFICATION : BACHELOR OF ENGINEERING IN MINING ENGINEERING	
QUALIFICATION CODE: 08BMENG	**LEVEL: 7**
COURSE CODE: GSS721S	**COURSE NAME:** GEOSTATISTICS
SESSION: JUNE/JULY 2023	**PAPER:** THEORY
DURATION: 3 HOURS	**MARKS:** 100

SECOND OPPORTUNITY EXAMINATION (SUPPLEMENTARY)	
EXAMINER(S)	**Prof Benjamin MAPANI**
MODERATOR:	**Prof. Mallikarjun PILLALAMARRY**

ANSWER QUESTION ONE (1) (40 marks) AND ANY OTHER THREE (3) (20 marks each)

Formulas

- Statistical Variance: $\sigma^2 = \sum (X_i-\mu)^2 / n$
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- Where n is the number of data points in the given set, and μ is the mean.
- Geostatistical Variance: $\sigma^2 = \sum (X_i-X_{i+h})^2 / n$
- Where n is the number of pairs

The standard deviation (SD) is the square root of the variance.

1. You are given the following data in Table 1 for a gold mine where the cut-off grade is 2 g/t, with a high nugget effect. Furthermore, you are told that the mining blocks are 20 wide x 20 long x 10 m high:

   (i) Produce a semi variogram for this data set in the E-W direction only [20]
   (ii) What is the variance of your data set? [2]
   (iii) Calculate the mean [4]
   (iv) Perform a capping exercise at mean+1 SD and produce a new grid of mining capped grades. Briefly state the advantages of capping high grades [2]

   (v) Discuss what will happen to the variance if the mine opted to mine 10 x10 x 10 m blocks (x, y, z). Will it go down or will it increase? [4, 2]

   Table 1: Block grades of gold in 20 x 20 x 10 m blocks

3	4	3	5	8	3
3	5	9	6	4	3
4	4	3	3	2	2
3	3	6	3	3	3
2	2	7	7	9	4

2. (a) Distinguish between quantitative and qualitative evaluation of exploration and mining projects and the advantages and disadvantages of each approach. [10]
   (b) In mining it is usually observed that the data available to make decisions is not sufficient for ordinary statistical methods. What approaches are taken by Mining and Exploration companies to improve and make this data to be acceptable to the Stock Exchanges and Banking Firms to allow them access funding? [10]

3. Answer the following questions as succinctly as possible:
   (i) Discuss the revenue factors involved in operating a mining venture.[8]
   (ii) Discuss the main factors involved in the valuation of an ore body. [8]
   (iii) Distinguish the main differences between Geostatistics and Statistics.

4. (a) Distinguish between Measured, Indicated and Inferred resources with parameters that distinguish these three classes. [4, 4, 4]
   (b) In the country of Vietnam, there is a correlation coefficient of 0.9 between GDP and Foreign Direct Investment (FDI). Discuss the pros and cons of this data for Vietnam. [8]

5. (a) In dealing with geological data, discuss the methods used to deal with outliers.

(b) In a deposit with both uranium and vanadium present, what will be the advantage of using correlation coefficients of the grades as mining progresses? Name two advantages of applying correlation coefficients to by products associated with the major commodity in a deposit. [8, 12]