



PROGRAM : B.TECH. MINERAL RESOURCE
MANAGEMENT
SUBJECT : GEOSTATISTICS
CODE : GEOS41-1
DATE : 26 JULY 2019
: SUPPLEMENTARY EXAMINATION

DURATION : 3 HOURS (08:30 – 11:30)

TOTAL MARKS : 100 Marks

FULL MARKS : 100 Marks

LECTURER : Mrs M MPANZA

MODERATOR : Prof H GROBLER

NUMBER OF PAGES : 5

INSTRUCTIONS : - ANY CALCULATOR PERMITTED.
- CANDIDATES ALLOWED TO MAKE USE OF THE
COMPUTER FACILITIES IN THE EXAMINATION
VENUE.
- FORMULA SHEET WILL BE SUPPLIED
- **NO EXTERNAL STORAGE DEVICES ALLOWED**
- **ALL WORK DONE ON COMPUTER MUST BE
TRANSFERRED INTO THE EXAMINATION SCRIPT**

REQUIREMENTS : NONE.

INSTRUCTIONS TO STUDENTS:

1. ANSWER ALL THE QUESTIONS.
2. WORK NEATLY AND SYSTEMATICALLY. MARKS WILL BE GIVEN FOR WELL LAYED OUT ANSWERS.
3. STUDENTS TO ENSURE THAT THEIR NAME AND OR STUDENT NUMBER APPEARS ON EACH SHEET HANDED IN.
4. STUDENTS MAY MAKE USE OF THE COMPUTERS AND FUNCTIONS ON EXCEL AVAILABLE IN THE VENUE
5. NO COMMUNICATIONS OF ANY KIND WILL BE ALLOWED BETWEEN CANDIDATES. .

QUESTION 1

1.1 A reef has two minerals being mined at the same time
i.e. Gold and Sulphur.

The semi-variogram for the gold values is;

ISOTROPICAL

RANDOM variability = 10.2 m.g/t^2

Structural model: Linear

Sill = 9.8 m.g/t^2 and

Range of 128m

Nugget effect 6.0 m.g/t^2

The semi-variogram for the Sulphur values is;

ANISPTROPICAL

RANDOM variability = 18 \%Sulphur^2

Structural model: Gaussian

Sill = 24 \%Sulphur^2

Range = 94m N40°E

Nugget effect of $= 0 \text{ \%}^2$

The semi-variogram between the gold and Sulphur values is;

ISOTROPICAL

RANDOM variability = $16 \text{ m.g/t. \%Sulphur}$

Structural model:

1st Structure is Spherical with a sill of $14 \text{ m.g/t. \%Sulphur}$ and a range of 24 m

2nd Structure is Linear with a sill of $10 \text{ m.g/t. \% Sulphur}$ and a range of 88 m

Nugget effect = 4 m.g/t. \%

Using the information provided in 1.1:

a) draw a sketch of the gold semi-variogram 7.5 marks

b) draw a sketch of the sulphur semi-variogram 7.5 marks

c) draw a sketch of a semi-variogram between gold and sulphur 10marks

NB: Semi- variogram must be fully labelled

[25 marks]

QUESTION 3.

3.1 Discuss and explain, in your own words, the following Geostatistical terminology.

(IMPORTANT NOTE: Refer in your explanation to the meaning as well as the possible causes for and ways to overcome or deal with the phenomena where applicable)

- Simple Kriging
- Second order stationarity
- Variability associated with regionalised variables
- Ordinary kriging
- Support

[10 marks]

3.2 Give an estimate for the central point using Inverse Distance Weighting Squared method and the information available.

Sample Number	Easting	Northing	Value % Metal
1	0.0	500.0	44.0
2	0.0	400.0	42.0
3	0.0	300.0	37.0
4	100.0	300.0	37.0
5	200.0	300.0	37.0
6	200.0	400.0	43.0
7	200.0	500.0	40.0
?	100.0	400.0	?

Boreholes were drilled on a 100.0 m by 100.0 m grid

NB: Use IDW² and assume a regular grid

[20 marks]

TOTAL [100 MARKS]