

- This question paper consists of FIVE pages including this cover page.
- All questions must be answered.
- All answers and sketches to be presented in a neat and decipherable manner. Papers will not be marked if not decipherable.
- Restrict the use of highlighters.
- Do not use a red pen.
- Read the instructions on the front page of your answer book carefully.
- No cellular phones shall be allowed in the examination venue.
- The use of computers, laptops and palmtops is prohibited.

NOTE:

TIME ALLOWED: 3 HOURS
(12h30 to 15h30)

DATE: 08 OCTOBER 2014
TOTAL MARKS: 100
TO PASS: 50

MINING ECONOMICS II

MINE SURVEYOR'S CERTIFICATE OF COMPETENCY EXAMINATION

Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA



Question 1:

a) Explain what is meant by the following terms:

- i. Anisotropy (2)
- ii. Covariance (2)
- iii. Cross Validation (3)
- iv. Discretization (2)
- v. Geostatistics (2)
- vi. Kriging (2)

b) Describe with the aid of annotated sketches the differences between the

following types of correlation:

- i. Positive correlation (2)
- ii. Negative correlation (2)
- iii. No correlation (2)
- iv. No linear correlation (2)
- v. Describe with the aid of annotated sketches the differences between Classical Statistics and Spatial Statistics (Geostatistics) (8).

[29 Marks]

Question 2:

The following sampling values in g/t, in respect of the sampling of a lognormal gold ore deposit, are available:

4,8 5,2 5,1 5,4 6,0 7,8 10,2 14,1 18,2

The anticipated stopping width is 110 cm with an additive constant of 200 cm.g/t. The pay limit for the mine is 6,0 g/t and mining is expected to take place at a log variance of 0,3. It is also estimated that there are 2 million tons of gold ore in the deposit.

- Calculate:
- a) The mean value for each variable
 - b) The standard deviations (both for a sample and population) for each variable
 - c) The correlation coefficient
 - d) The regression line y on x

X	Y
3.8	5.8
4.8	4.7
6.2	8.4
8.2	9.2
8.3	9.6
9.4	10.1
11.5	11.2
18.6	14.2
19.2	17.8

The following table shows the sampling results of two variables. It is decided that only variable x , will be sampled in future:

Question 3:

[18 Marks]

- a) Calculate the mean grade in g/t
- b) Calculate the amount of payable tons in the deposit
- c) Calculate the grade of the tonnage determined above
- d) If the given results were obtained from borehole drilling, what will the grade of the gold deposit be?
- e) Briefly explain why a lognormal distribution is also referred to as a three parameter distribution and what is the purpose (if any) of the third parameter.

[26 Marks]

- a) Draw a histogram
 b) Draw the frequency polygon and the frequency distribution from the histogram
 c) Calculate the cumulative frequencies ("less than" and "more than")
 d) Calculate the frequency percentages
 e) Calculate the cumulative frequency percentages
 f) Draw the "less than" and "more than" ogives
 g) Comment on the frequency distribution obtained in (b)

You are required to do the following,

11	16	12	27	31	14	23	24	23	25
31	21	24	25	24	17	21	34	26	22
21	20	25	22	23	26	27	29	24	36
35	18	19	23	26	33	18	37	13	29
34	30	26	31	28	26	28	22	32	33

Question 4: The following borehole values in (% MgO) were obtained by means of a sampling exercise carried out on a Magnesium Oxide deposit.

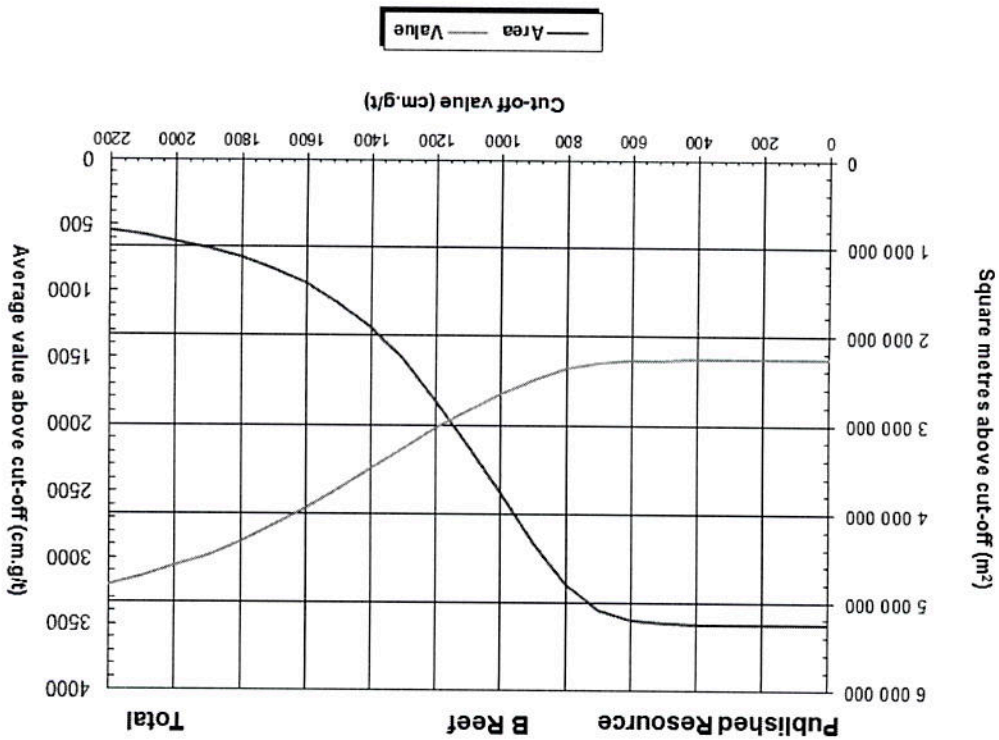
[17 Marks]

- a) The significance of r^2 in terms of the total variation in y as explained by the linear relationship between x and y
 b) The type of correlation between the two variables

Explain:

Question 5:

Aprilla Gold Mine



Determine graphically the following from the above Value Area Curve:

- a) The mean value of the deposit
- b) The total reef m² in the deposit

If the pay limit/break-even value of the mine is 1 400 cm.g/t and a margin of 14.28% is added what will the following answers be?

- c) My new required mining value to achieve a margin of 14.28%
- d) The amount of reef m² available to be mined to achieve the 14.28% profit margin
- e) Based on the signature of the ore body what will the minimum value of any part of the resource have to be to still contribute to the desired profit margin?

[10 Marks]

Total Marks [100]