



mineral resources

Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

MINE SURVEYOR'S CERTIFICATE OF COMPETENCY EXAMINATION

MINING ECONOMICS II

DATE: 30 September 2015

**TOTAL MARKS: 100
TO PASS: 50**

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

NOTE:

- 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.

Question 1:

- a) Explain what is meant by the following terms:
- i) Geostatistics (2)
 - ii) Cross Validation (2)
 - iii) Anisotropy (2)
 - iv) Block Kriging (2)
 - v) Ordinary Kriging (2)
- b) Draw an annotated sketch of a Spherical Semivariogram illustrating your understanding of the function of the following components:
- i) Nugget
 - ii) Sill
 - iii) Range (10)
- c) Name four (4) essential assumptions made when attempting to describe a populations statistics from its samples data. (8)

[28 Marks]

Question 2:

The area of a working mine amounts to 1000 claims of which 13% already stoped out. Of the remaining area 7% is barren due to faults; 10% of the monthly tonnage hoisted is obtained from reclamation in old areas; surface sorting amounts to 7% and 5% of ore broken in stopes is sorted and packed underground. The average stoping width is 148 cm and the average dip is 22°. Ignoring development tonnages, determine the life of mine, assuming:

- a) 99 000 metric tons are milled per month
- b) The percentage payability is 50%
- c) The density of rock is 2.75 t/m³
- d) 1 claim is 6 000m²

(15 Marks)

Question 3:

The following information is known in respect of a base metal deposit.

- Total tonnage in the deposit = 72 000 Tons
- Mean value of the deposit = 8% metal
- Population standard deviation = 1.25% Metal
- The values are normally distributed.

Calculate the pay value and payable tonnage to be mined in order to obtain a profit if the pay limit for the relevant mine is 6% metal.

(12 Marks]

Question 4:

The results of an exploration programme based on 240 samples of approximately 3 tons each, show that the values are normally and randomly distributed with a mean value of 33% MgO and a standard deviation of 10.6% MgO. It is estimated that 30 000 000 tons would be payable with a pay value of 37.9% MgO for a mining pay limit of 26.8% MgO. However, the minimum quantity that can be allocated to either the mill or waste dump is a truck load of 30 tons.

- a) Calculate the total tons in the deposit.
- b) Determine the payable tons and pay value for the given mining conditions.
- c) Determine the 90% confidence limits for the mean value.

[20 Marks]

Question 5:

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

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

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

Explain:

- 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

[16 Marks]

Question 6:

A company has to make a choice between two projects, because the available resources in money are not sufficient to run both at the same time. Each project would take 3 years.

- a) The first project is process optimization which would result in cost reduction of R135 000 per year. This benefit would be achieved immediately after the end of the project.
- b) The second project would be the development of new product which could produce the following net profits after the end of each year:
 - 1 year R16 875
 - 2 year R140 625
 - 3 year R247 500
- c) Assumed is a discount rate of 6% per year.
- d) Looking at the present values of these projects revenues in the first 3 years which project should they invest in?

[9 Marks]

Total Marks [100]