mineral resources

Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

MINE SURVEYOR'S CERTIFICATE OF COMPETENCY EXAMINATION

MINING ECONOMICS II

DATE: 04 Oct 2016

TOTAL MARKS: 100
TO PASS: 50

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

NOTE:

- This question paper consists of **THREE** 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) In terms of a variogram's directional behavior explain with the aid of diagrams or sketches what is meant by the following terms:
   i) Isotropic behavior (3)
   ii) Anisotropic behavior (3)

b) Name four essential assumptions which are made when attempting to describe a population's statistics from its sample data. (4)

c) Describe what you understand is meant by the following terms.
   i) Cross Validation (2)
   ii) Kriging (2)
   iii) Nugget Model (2)
   iv) Simple Kriging (2)
   v) Ordinary Kriging (2)

d) Explain with the help of annotated sketches the differences between a normal, positively and negatively skewed distribution. (6)

[26 Marks]

Question 2:

The results from an underground sampling exercise carried out on a gold mine are as follows:

a) The ore body follows a two parameter lognormal pattern
b) Number of samples = 299
c) The standard deviation for a sample is 1 g/t
d) The mean of the ln(x) values is 2.9 g/t

Calculate:

a) The mean value of the ore body
b) The 95% upper and lower limit for the estimate

[15 Marks]

Question 3:

Explain briefly in your own words the meaning of the following project related concepts.

i) Payback period.
ii) Capital costs.
iii) Exploration cost.
iv) Net present value (NPV).
v) Internal rate of return (IRR).

[10 Marks]

Question 4:

The following values, in grams per ton, were obtained from an underground reef raise which was recently sampled.

11, 29, 12, 27, 31, 14, 23, 24, 23, 25.

Calculate:

a) The mean.
b) The mode.
c) The median.
d) The standard deviation for a sample.
e) The standard deviation for the population.
f) The sample variance.
g) The population variance.
h) The population standard deviation mean.
i) The population standard deviation mean if samples have a mass of 5kg and 30kg of ore is sent to the plant.

[20 Marks]

Question 5:

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 R120 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 the project.
   1 year R15 000
   2 year R125 000
   3 year R220 000
c) Assumed is a discount rate of 5% per year.
d) Looking at the present values of these projects revenues in the first 3 years which project should they invest in?

[10 Marks]

Question 6:

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.

[19 Marks]

Total Marks [100]