REPUBLIC OF SOUTH-AFRICA
DEPARTMENT OF MINERALS AND ENERGY
EXAMINATION FOR THE MINE SURVEYOR'S CERTIFICATE OF COMPETENCY

DATE: 16 October 2003 (Thursday) TOTAL
MARKS: 100
TIME: 12:30 – 15:30 (3 Hours) TO PASS: 50

MINING ECONOMICS II

NOTE:

1. Any pocket calculator may be used and intermediate results need not be shown. The make and model number of the calculator used must be noted on the front cover of answer book.
2. Tables that may be used are attached hereto.
3. Graph-, Probability-, and Log paper will be supplied if required.
4. Your examination number must be written on all graph paper and loose sheets that are handed in with your examination script.

Question 1

Describe :

a) Mode
b) Median
c) Quartiles
d) Inter quartile range
e) Deciles
f) Kurtosis

[9 marks]

Question 2

A surface deposit was sampled along the outcrop by 100 two ton samples. Analysis indicated that the sample values were normally distributed. The mean of the samples was 10% metal with a standard deviation of 6.5% metal.

Initial estimates indicated 20×10^6 tons of payable ore at 12% metal, measured against a pay limit of 6% metal.

What will the pay value and payable tons be for mining units of 25 tons?

[14 Marks]

40

Question 3

The table below shows the monthly tons concentrate recovered from tons milled at a base metal mine. The concentrate is smelted to recover the metal.

	Tons milled	Concentrate (t)
Jan	78 000	1 690
Feb	73 000	1 470
March	63 500	1 360
April	97 000	1 800
May	93 000	1 650
June	89 000	1 640

a) Calculate the correlation coefficient.

b) Test whether $\rho=0$ at the 0,05 level of significance. Student t-test

c) What tonnage should be milled to satisfy the current smelter capacity of 2 000 tons?

d) By how much must the smelter capacity be increased to accommodate 150 000 tons milled per month?

[10 Marks]

$H_0: \rho = 0$

$H_a \rho > 0$

$t_c = 2,776$

$t =$ [illegible]

2,776

Question 4

Ore resources on a base metal mine conforms to a normal distribution with a mean grade of 1,5% metal and variance 0,36% metal. The total blocked resource is 15 million tons.

a) Draw grade tonnage curves from 1,0% to 2,0%.

b) Estimate from the graph what the pay tons and pay value at a cut off grade of 1,1% will be.

[20 Marks]

41

Question 5

a) Calculate the mean grade of the following samples from a log normal distribution with an additive constant of 90cmg/t.

g/t	Width (cms)
4,0	120
5,0	100
5,8	100
6,2	120
7,9	120
9,2	95
13,0	125
18,2	130
5,4	115

b) Calculate the 95% upper confidence limit for the mean value.

[15 Marks]

Question 6

The 5 boreholes, each with 4 deflections were drilled to cover a prospective mining area. The table lists the cmg/t values.

B/H	Defl.1	Defl.2	Defl.3	Defl.4
1	240	790	350	460
2	1 850	2 550	820	1 580
3	590	890	300	700
4	3 400	1 200	2 850	1 950
5	350	710	190	640

The four deflections of each borehole lie within a radius of 1 metre.
The five boreholes are evenly spread over the 2 000ha lease area.
Additive constant a= 0.
Block sizes of approximately 2 500m^2 on the plane of the reef are expected.
Dip of reef = 40°
Stoping width = 110 cm.
Shortfall = 8% of tons hoisted.
Geological loss = 10%.
Mill Recovery = 96%
MCF = 93%
Density of ore =2,83t/m^3
Milling rate = 200 000t/m.

Make an estimate of the life of mine and the recovery grade for a pay limit of 5,0g/t.

[22Marks]

42

Question 7

a) When transforming a mean value back from logs, how would you decide between using $e^{\alpha+\beta^2/2}$ and Sichel?

b) Describe the difference between a resource and a reserve.

c) What is meant by:
   i) Central Limit Theorem
   ii) Nugget effect
   iii) Anisotrophy
   iv) Support

[10 Marks]

[TOTAL 100 Marks]

43