REPUBLIC OF SOUTH AFRICA
DEPARTMENT OF MINERAL RESOURCES
EXAMINATION FOR THE MINE SURVEYOR'S CERTIFICATE OF COMPETENCY

DATE: 14 October 2011 (Friday) TOTAL MARKS: 100
TIME: 08:30 – 11:30 (3 Hours) TO PASS: 50

MINING ECONOMICS I

NOTE:

1. Any pocket calculator may be used. The make and model number of the calculator used must be noted on the front cover of the answer book.
2. Assume RD of in situ rock = 2.75 t/m³ unless stated.
3. Answer all questions.

Question 1

Define the following:

a) Ore reserve mining factor (3)
b) Development (2)
c) Payable development (2)
d) Milling width (2)
e) Tramming width (2)
f) Tonnage discrepancy (3)

[14 marks]

Question 2

A borehole is drilled at 68° below the horizontal in a direction of 55° (Zero South) to intersect a reef which strikes North-South exactly and dips at 42° due east. Using the information in the core log below, calculate:

a) The true reef width and value.
b) The channel width and value.

Core log:

Length of core (cm)	Assay value (g/t)	Remarks
27	4.3	Scattered pebbles
32	Trace	Waste
26	11.5	Small well compacted pebbles
11	Trace	Waste
22	27.0	Highly mineralised
9	32.7	Highly mineralised

[14 marks]

Question 3

A complex ore body composed of the under mentioned five minerals, is being opened up for mining. The density and proportions of these minerals in the ore body are as follows:

Mineral	RD t/m^3	% by volume
A	3,8	8
B	5,4	5
C	3,2	65
D	4,7	1
E	2,5	21

It is estimated that, when mining takes place, the amount of country rock mined will increase the stoping width by 10% of the width of the ore body. The density of the country rock is $2,8t/m^3$. Allowing 12% for porosity of the ore body and country rock in situ, derive a formula for tonnage stoped in terms of m^2 mined and stope width (cm).

[12 marks]

Question 4

a) Why is a Mine Call Factor calculated on gold mines?
b) List 6 variable components of the Mine Call Factor.

[9 marks]

Question 5

Explain how alluvial deposits are sampled.

[4 marks]

Question 6

From the beginning of a financial year the development advance in a gold mine is to be reduced from 2000m to 1000m per month for a period of twelve months only. During this period, the rate of milling and working profit is to be maintained at its former level by mining more ore from reserve.

Calculate:

a) The Ore Reserve Mining Factor prior to the reduction in development.
b) The block value of ore reserve mined and the Ore Reserve Mining Factor when the mine operates on the new basis.
c) The percentage payability of development, assuming that this will remain constant and that, prior to the change in policy, development advances had maintained the ore reserve position.
d) The ore reserve position at the end of the twelve month period, assuming that the value of new ore brought in by development is at the value of the ore reserve at the beginning of the year.

Given:

Ore reserve at the beginning of the year	3 500 000t at 22,5g/t
Average stoping width	120cm
Block Factor	104%

Monthly operations prior to the change:

Tonnage milled	100 000t
Surface sorting	10% at 0,5g/t
Plant Recovery Factor	97%
Mine Call Factor	90%
Tonnage discrepancy	Nil
Working costs	R1 560/t milled
Breaking costs:	
Development	R10 500/m advanced
Stoping	R1 450/m²
Price of gold	R245 000/Kg

Ore mined monthly from:

Source	Tons	Current sampling value (g/t)
Ore reserve	90 000	21,0
Development	10 000	6,0
Other sources	10 000	7,0

Assume:
Overhead charges are constant
Density of rock is 2,75t/m³
All driving, raising and winzing are on reef and amounts to 50% of total development advance
Raise-winze connections are 130m apart and 100m in length

[30 marks]

Question 7

a) In carrying out assays for gold on mine samples, an assayer obtains a bead consisting of gold and silver, from the weight of which he deducts 10% for the silver and returns the remaining weight as grams of gold per ton in the sample.
If subsequent investigation showed that the silver content is actually 15% of the total gold and silver, what was the percentage error in the sampler's determination of the value of the ore mined?

b) Assuming correct assay conditions for mine samples as well as for those of waste sorted, determine the true Mine Call Factor from the following data:

Sampler's value of ore mined	= 11,0 g/t
Waste sorted	= 25%
Value of waste sorted	= 1,1 g/t
Actual recovery per ton milled	= 9,5 g/t
Extraction	= 97%

c) What erroneous Mine Call Factor would have been returned with data as in (b) if assays of mine samples as well as for those of waste sorted, were made by the incorrect method set forth in (a)?

[17 marks]

Total [100marks]