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

DATE: 17 April 2009 (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 and intermediate results need not be shown. The make and model number of the calculator used must be noted on the front cover of the 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

Give a description of the following terms used in mine valuation:

a) Development
b) Block width
c) Stope width
d) Mine call factor
e) Reclamation ore
f) Dilution tonnage
g) Milling width

(7 marks)

Question 2

a) Why is a mine call factor calculated on gold mines?
b) Give 6 variable components of the mine call factor.

(6 marks)

Question 3

Describe the procedure followed in the assay office from the delivery of gold ore samples to the dispatch of the results.

(15 marks)

Question 4

A borehole is drilled at 65° below the horizontal on a bearing of 50° (zero south) to intersect a reef which strikes North-South exactly and dips at 40° 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
31	4.75	Scattered pebbles
30	Trace	Waste
26	12.07	Small well compacted pebbles
10	Trace	Waste
20	26.05	Highly mineralised
8	30.12	Highly mineralised

(14 marks)

Question 5

i. Use the information below to calculate the following:
   a) The tramming width and value (g/t)
   b) The milling width and value (g/t)

Area stoped on reef	10 000m²
Stope width and value	100cm @ 12.5g/t
Waste mined from gullies	800 tons @ 0.0g/t
Waste sorted in stopes	1 500 tons @ 2.6g/t
Development advance on reef	105m @ 3.0m wide X 2.5m high
Value of development rock	9.5g/t
Waste sorted on surface	5 000 tons @ 0.9 g/t
Rock density	2.75 t/m³

ii. Explain the difference between the tramming width and milling width.

(12 marks)

Question 6

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

Mineral	RD t/m^3	% by volume
A	4.6	8
B	6.9	5
C	2	65
D	6.6	1
E	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 7

The average stoping width of a gold mine has been reduced from 120cm to 100cm and the amount of underground sorting from 15% to 10%. The value of the waste rock sorted is 0.9g/t. The cost per m^2 broken remains constant at R3 100 and extraction at 95%. If the original working costs were R2 500 per ton milled and the mine call factor 90%, calculate the new pay limit based on a gold price of R250 000/Kg. Assume that there is no change in the rate of milling. The rock density is $2.75t/m^3$.

(12 marks)

Question 8

A mine reports an annual shortfall of 18%. Give possible reasons for the shortfall.

(5 marks)

Question 9

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 =	10.0 g/t	
Waste sorted	=	20%
Value of waste sorted	=	1.0 g/t
Actual recovery per ton milled	=	9.0 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 Marks [100]