

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

DATE: 16 April 2010 (Friday)
TIME: 08:30 – 11:30 (3 Hours)

TOTAL MARKS: 100
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

Explain the following terms used in mine valuation:

- | | |
|--------------------------|-----|
| a) Block call factor | (2) |
| b) Residue value | (2) |
| c) Block | (3) |
| d) Tonnage discrepancy | (3) |
| e) Milling width | (2) |
| f) Dilution tonnage | (2) |
| g) Payable development | (2) |
| h) Secondary development | (2) |

[18 Marks]

Question 2

Ten vertical boreholes were drilled to sample a horizontal coal seam. The coal seam covers 300ha. The sampling results are as follows:

Borehole No.	True width cm	Average calorific value MJ/Kg
1	254	28,065
2	268	27,154
3	279	28,268
4	305	28,000
5	295	26,592
6	203	27,750
7	310	27,926
8	254	27,907
9	260	27,500
10	228	27,681

The coal block (300ha) is being worked on the board and pillar system, with pillars 10m x 10m having centres of 16m. During the first year of production 220 000 tons of coal was sold and 20 000 tons, at an average calorific value of 19,00 MJ/Kg, were discarded.

Assume the following:

- The results of the sampling are accurate.
- The percentage discard and its calorific value will remain the same in the future years as in the first year.
- 10% of the area will not be mined due to geological losses.
- The tonnage sold from year two will increase to 300 000 tons per annum.
- Density of in situ coal is 1.43 tons/m³.

Calculate:

The average calorific value of the coal sold.

The total life of the 300ha coal block.

[22 Marks]

Question 3

State and briefly discuss five of the variable components of the mine call factor.

[10 Marks]

Question 4

A reef drive has advanced a distance of 120m on a flat reef. The reef is 14cm thick with an average value of 90,0g/t. The overall dimensions of the reef drive were 3,5m wide and 3,0m high. The ballast left for the laying of tracks, had an average depth of 11cm at a value of 7,0g/t. Calculate the tonnage and value of the broken rock trammed to the mill, assuming that the density of ore and country rock is $2,7\text{t/m}^3$ and that of ballast is $2,3\text{t/m}^3$.

[8 Marks]

Question 5

A gold mine, currently milling 80 000 tons per month, plans to increase both the amount of development ore to the mill and the percentage waste sorted, while also decreasing the amount of external waste mined. If the milling rate is to remain unchanged, show how the grade of the ore milled and the recovery grade will be affected if:

- Ore milled from development is increased from 3 000 tons at 5,0g/t to 4 800 tons at 4,85g/t.
- Surface sorting increases from 5% at 0,5g/t to 10% at 0,75g/t (surface sorting is expressed as a percentage of tons hoisted)
- Average stoping width is reduced from 124cm to 118cm.
- Original channel width and value are 47cm and 44,3g/t respectively.
- Tonnage discrepancy is nil.
- MCF = 97%
- Plant recovery factor = 92%

[17 Marks]

Question 6

Explain what is meant by:

- Pay Limit
- Ore Reserve Mining Factor
- Under / Over mining

b) Given the following information, calculate the block factor for each block, as well as the average block factor:

Block Number	Block Area	Block Value	Block Width	Mined area	Mined Value	Mined Width
	m ²	g/t	cm	m ²	g/t	cm
1	5 400	7,34	105	5 400	7,5	110
2	10 000	3,75	100	9 800	4,15	98
3	6 200	4,56	113	6 200	4,62	108
4	750	15,32	124	750	15	122
5	7 500	15,72	112	7 300	10,61	119
6	5 100	8,75	150	5 000	10	140
7	8 500	6,42	115	8 300	6	115
8	4 200	12,74	175	4 200	8,25	225
9	3 000	18,75	100	2 800	12,97	115
10	9 000	10,12	115	8 500	10,65	114

Density of rock = 2,737 t/m³

c) List and briefly describe the conditions that could affect the block factor.

[25 Marks]