



**mineral resources**

Department:  
Mineral Resources  
REPUBLIC OF SOUTH AFRICA

## **MINE MANAGER'S EXAMINATION**

### **METAL MINING II MINING TECHNICAL SERVICES**

**DATE:** 12 MAY 2010                      **TOTAL MARKS:** 100  
**TO PASS:** 50

**TIME ALLOWED:** 3 HOURS  
(08h30 to 11h30)

**NOTE:**        **ANSWER ALL THE QUESTIONS**

- This question paper consists of **FIVE** pages.
- 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 or pencil.
- Read the instructions on the front page of your answer book carefully.
- Show all your workings where necessary
- No cellular phones shall be allowed in the examination venue.

## QUESTION 1

1.1 As the appointed Manager of a mine situated in close proximity of local villages how will you deal with the following issues:

1.1.1 Monitoring systems and procedures for subsidence, water pollution, dust, noise and toxic waste. (5)

1.1.2 Effects of Mining on the community before, during and after mining, community projects, taxation, levies, education, training and employment. (5)

**[10 Marks]**

1.2 With reference to emergency preparedness for your mine explain how you will design, implement and monitor the following: -

1.2.1 Reduction in the risk of fires and the management thereof required during the event of a large fire. (3)

1.2.2 Flooding of the mine. (2)

1.2.3 Seismic events and major rock falls. (3)

1.2.4 Labour unrest or industrial action. (2)

**[10 Marks]**

1.3 You plan to test and implement a new mechanized drill rig in order to drill shot holes for development ends.

1.3.1 Discuss how you will go about it in a safe manner.

**[5 Marks]**

**Total: [25 Marks]**

## QUESTION 2

2.1 The heat transfer rates at an evaporator and exchanger it is connected to are 1100 KW and 800 KW respectively.

2.1.1 What is the positional efficiency of the Plant?

[3 Marks]

2.2 Two parallel airways each carrying 30 m<sup>3</sup>/s for a pressure drop of 500 Pa, share a common inlet and outlet. It is desired to increase the flow of air in one airway to 50 m<sup>3</sup>/s by speeding up the fan producing the flow, but the quantity in the other airway is to remain constant at 30 m<sup>3</sup>/s.

2.2.1 What size regulator must be installed to achieve this aim?

[6 Marks]

Air density = 1,18 kg/m<sup>3</sup>

2.3 A stoping section draws air from two airways as follows: -

10 m<sup>3</sup>/s at carbon monoxide concentration of 0,03 %

17 m<sup>3</sup>/s at zero carbon monoxide

2.3.1 What is the resulting concentration of carbon monoxide in the stope air?

[3 Marks]

2.4 A new mine requires a shot hole initiation system. Describe: -

2.4.1 The various options available and the advantages and disadvantages of each.

[6 Marks]

2.5 In order to prevent dust from entering the workings a multi bag filter is installed in a control crosscut next to the tips. Assume tip dimensions are 1,8 m X 3,3 m and bag sizes are 2,0 m X 200 mm.

2.5.1 How many bags should this filter have?

[7 Marks]

[Total: 25 Marks]

### QUESTION 3

3.1 What is your understanding of the following financial terms: -

3.1.1 Return on assets (ROA)

(1)

3.1.2 Net present value (NPV)

(1)

3.1.3 Internal rate of return (IRR)

(1)

**[3 Marks]**

3.2 Explain your understanding and purpose of the following Rock Engineering terminology.

3.2.1 Seismic event

(1)

3.2.2 Active support

(1)

3.2.3 Long hole tendons

(1)

3.2.4 Pillars in a Bord and pillar mine design

(2)

**[5 Marks]**

3.3 The mine is designed to be a Bord and Pillar layout. Assume the following: -

Depth below surface = 350 metres  
Density of rock = 2 700 kg/m<sup>3</sup>  
Gravity = 9,8 m/s<sup>2</sup>

The pillars are 8 metres long and 5 metres wide and are spaced 12 metres apart, skin to skin on dip and strike.

3.3.1 Calculate the pillar stress.

**[5 Marks]**

3.4 The law requires that a mine will have a “social and labour plan”.

3.4.1 What is the purpose and components of the plan?

**[5 Marks]**

3.5 Often trackless mechanized mining methods (TM3) are used to extract the upper group chromite horizon (UG2). This method results in excessive dilution of the ore transported to metallurgical plant. Discuss the following: -

3.5.1 Scalping

(2)

3.5.2 Dense medium separation (DMS)

(2)

3.5.3 The principle of a DMS plant with the aid of sketches (Do not use a pencil)

(3)

**[7 Marks]**

**[Total: 25 Marks]**

#### **QUESTION 4**

4.1 On your appointment as Manager you are made aware of the following problem. A planned large excavation silo measuring 20 m high X 5 metre radius was excavated in very poor geologically disturbed ground. These geological features intersected the excavation parallel. The large excavation with its associated geological disturbances caused problems when drilled

and blasted. Most of the long shot holes drilled did not fire. This caused the excavation to be only 2,5 metres radius with big rocks blocking the bottom throat. Discuss how you will handle the situation under following headings: -

- 4.1.1 The method statement for excavating the silo to its planned 5,0 m radius. (2)
- 4.1.2 Safety related issues, handling the big rocks at the bottom of the silo and treatment of misfires. (2)
- 4.1.3 Support of excavation and making safe of sidewall. (2)
- 4.1.4 Equipment required. (2)
- 4.1.5 Training and skills required for the work. (2)

**[10 Marks]**

4.2 A new mine is planned with an orebody 1 000m below surface. Discuss how you will assess the geological structure of the mine with regards to all geological information. **[5 Marks]**

4.3 Big and capital intensive mine projects are subjected to a rigorous approval process from the owner to assess the viability of the project.

- 4.3.1 What are the various phases? (2)
- 4.3.2 Typical duration of the phases. (2)
- 4.3.3 Project team composition. (2)
- 4.3.4 Typical flaws and critical success factors. (2)
- 4.3.5 The execution of the project. (2)

**[10 Marks]**

**[Total: 25 Marks]**

**TOTAL [100]**