



mineral resources

Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

MINE MANAGER'S CERTIFICATE OF COMPETENCY EXAMINATION

METALLIFEROUS MINING 11 MINING TECHNICAL SERVICES

DATE: 09 MAY 2012

TOTAL MARKS: 100

TO PASS: 50

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

NOTE:

- This question paper consists of **THREE** pages including cover page.
- All questions must be answered.
- 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.
- Read the instructions on the front page of your answer book carefully.
- No cellular phones shall be allowed in the examination venue.
- The use of computers, laptops and palmtops is prohibited.

QUESTION 1

The eventual designed operating characteristics of a fan are $155\text{m}^3/\text{s}$ at $5\,100\text{ Pa}$ and 15 revs/s .

Initially, however this fan must operate at a lower duty for 4 years and to this end will operate at 11.8revs/s with no change in the original fan efficiency of 82% .

It is possible to alter guide vane settings on this fan, to obtain the lower quantity requirements whilst still retaining the original speed of 15revs/s , although efficiency will fall to 65% as a result.

Capital cost of a two speed fan-motor to give 15 or 11.8revs/s is $\text{R}290\,000$, whilst a single speed motor costs $\text{R}230\,000$.

1 kW year costs $\text{R}1200$ (including maximum demand)

The P.V. of $\text{R}1$ per year at 9% C.I. p.a. for 3 years is $\text{R}2.53$

Motor efficiency is 92%

Of these two options, which is more economical? **[25]**

QUESTION 2

A Mine would like to develop a hoist room chamber at a deep level Gold mine. The hanging wall depth of the chamber will be 2850m below collar. The final dimensions of the chamber are 12m high by 15m wide and 35m long. What factors would you consider in the sequence of developing and supporting this chamber?

Expected life of chamber is 25 years. **[25]**

QUESTION 3

A layout has been recommended for a section of the mine as follows:

The ore body is a flat, lenticular lead/zinc ore body, where the stoping width is expected to be 2.1m in the area concerned. The ore body is at a depth of 500m below surface.

Pillars are recommended which are 5m square, at spacing of 15m centre to centre.

The density of overburden is $2\,800\text{ kg/m}^3$

Uniaxial compressive testing has shown the ore to have a strength of 60MPa .

Calculate the following:

3.1 The planned percentage extraction. (5)

3.2 The strength of the pillars, using the formula $P_s = \frac{kW^{0.46}}{h^{0.66}}$

Where P_s =average pillar strength

k is a rock dependant constant (60MPa in this case)

w is the pillar width

h is the pillar height (5)

3.3 Is the factor of safety on the pillar design adequate in your opinion? (5)

3.4 You wish to redesign the layout to a factor of safety of 1.5

How will this affect your size and spacing's (10)

[25]

QUESTION 4

You wish to use a contracting company to open up an old area and start a vamping and reclamation operation. It is an old worked out section of your gold mine at a depth of 3000m below collar.

This section has been completely sealed for the last 6 years. You do not have experience of using this company before. Explain how you would ensure that they are not exposed to any environmental risks, explaining clearly the following:

4.1 What risks might exist? (8)

4.2 How these risks would be assessed and dealt with? (8)

4.3 How would you ensure the crew is competent to undertake this work? (9)

[25]

TOTAL MARKS: [100]