



mineral resources

Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

MINE MANAGER'S CERTIFICATE OF COMPETENCY EXAMINATION

METAL MINING II MINING TECHNICAL SERVICES

DATE: 20 OCTOBER 2010

TOTAL MARKS: 100

TO PASS: 50

TIME ALLOWED: 3 HOURS

(08h30 to 11h30)

NOTE:

- This question paper consists of **six** pages
- 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.

QUESTION 1

1.1 With reference to single underground borehole radar technology discuss the following issues:

1.1.1 Delineation of disruptions to flat tabular gold or platinum bearing reefs. (3)

1.1.2 Design and technology required and applied for reflection surveys. (2)

1.1.3 Interpretation and financial implications with particular reference to planning and return on investment. (4)

[9]

1.2 In terms of Managing Safety Risk related to energy sources discuss the following: -

1.2.1 List and explain briefly how these must be managed. (4)

[4]

1.3 In a development end a mechanical loader derails at least twice per shift. After the incident investigation action plans are drafted to rectify the identified sub standard conditions:-

1.3.1 Explain what the elements of the hierarchy of control are and how these must be applied in such a situation. (4)

[4]

1.4 Management of risk on a continuous basis is one of the most powerful forms of risk assessment.

1.4.1 List examples of daily risk assessments, where these are applied, by who and how it is closed out. (4)

[4]

1.5 In terms of risk ranking.

1.5.1 Explain and discuss the level of risk categories and necessary management intervention and action. (4)

[4]

[25]

QUESTION 2

2.1 Assessment of the social, environmental, health and safety implications of any project now form an integral part of all applications in the mining lease approval process. Discuss the following issues: -

2.1.1 Sustainable development (2)

2.1.2 Environmental impact assessments with particular reference to the public, effects on the environment, reporting, social risk, health and safety aspects of a project. (5)

[7]

2.2 For each project technical and economic studies are required to determine the project feasibility. Discuss the following concepts: -

2.2.1 Conceptual study (2)

2.2.2 Pre-feasibility study (2)

2.2.3 Feasibility study (2)

2.2.4 Pay back (2)

2.2.5 Net present value (2)

2.2.6 Financial risk analysis (2)

[12]

2.3 Your mine is experiencing a drastic decrease in grade delivered to the process plant. Discuss how you intend investigating the problem and the design of your action plans under the following: -

2.3.1 Stopping width, grade control and dilution. (3)

2.3.2 Influence of mechanized mining equipment. (2)

[5]

[24]

QUESTION 3

3.1 A result of 86dB(A) is obtained during a noise survey in a pump station when two identical pumps are operative. One pump is shut down for maintenance and the Safety Officer observes the pump attendant not wearing his hearing protection devices.

3.1.1. What will the noise level in the pump station be, with only one pump operative. (1)

3.1.2. What is the Occupational Exposure Limit (OEL) for noise. (1)

3.1.3. Can the Safety Officer institute disciplinary action against the pump attendant, for not wearing his hearing protection devices when one pump is shut down for maintenance. Explain your answer. (2)

[4]

3.2 The Occupational Hygiene Department takes regular swab samples in the change houses of the Mine:-

3.2.1 What is the purpose of swab sampling? (1)

3.2.2 At what stage should swab samples be taken? (1)

[2]

3.3 An Occupational Health Risk Assessment is performed in a working place where 92 employees are performing similar tasks. The risk assessment indicates exposures to respirable airborne dust at a level of 15% below the Occupational Exposure Limit (OEL).

3.3.1 Is a formal monitoring programme for the measurement of airborne pollutants required for this working place? Explain your answer. (1)

3.3.2 How many samples would be required per annum. (1)

3.3.3 What instrumentation is required to sample for the respirable fraction of dust. (2)

[4]

3.4 Ventilating of shaft sinking ends.

3.4.1 Sketch and describe a four-gate ventilation system. (3)

[3]

3.5 The pressure loss in a haulage, 170 m long, 3.0 m wide and 3.2 m high is 250 Pa. The friction factor of the haulage is $0.018 \text{ N s}^2/\text{m}^4$ and the air density is 1.15 kg/m^3 :-

3.5.1 What volume of air will flow through the haulage? (7)

[7]

3.6 Refrigeration plants are required to cool down deep mines with high virgin rock temperatures.

3.6.1 Name and describe the main parts of a typical cooling plant by means of a schematic diagram. (5)

[5]

[25]

QUESTION 4

4.1 Explain your understanding and purpose of the following Rock Engineering terminology:-

4.1.1 Closure (2)

4.1.2 Convergence (2)

4.1.3 Factor of Safety (2)

4.1.4 Stable Pillar (2)

4.1.5 Wedge (2)

[10]

4.2 The mine is designed to be a Board and Pillar layout with the following parameters:-

Depth below surface	650m
Rock density	3100kg/m ³
Gravity	9.8 m/s ²

The pillars are 10.0m in length and 6.0m wide and are spaced 6.0m apart skin to skin on dip and strike.

4.2.1 Calculate the percentage extraction. (2)

4.2.2 Calculate the Pillar stress. (3)

[5]

4.3 You are the Manager at a Mine known to have numerous low angle geological features present in the lease area. The mine will be a Board and Pillar operation. Numerous collapses have occurred along these low angle features.

4.3.1 What monitoring systems would you as the Mine Manager put in place to detect or identify these geological features in your mine? (5)

4.3.2 Numerous pillars in your Board and Pillar Section are showing signs of Pillar scaling, (fracturing) what are the possible causes of this occurrence? (5)

[10]

[25]

TOTAL MARKS: 100