



mineral resources
& energy

Department:
Mineral Resources and Energy
REPUBLIC OF SOUTH AFRICA

MINE MANAGER'S CERTIFICATE OF COMPETENCY EXAMINATION

MINING I METALLIFEROUS MINING

DATE: 07 MAY 2024

TOTAL MARKS: 100

TIME ALLOWED: 3 HOURS

TO PASS: 50

(09h00 to 12h00)

INSTRUCTIONS:

- This question paper consists of **FIVE** pages including the cover page.
- **All** questions must be answered and are to be presented in a neat and readable manner. Answer books will not be marked if not readable.
- Read the instructions on the front page of your answer book carefully.
- The use of a non-programmable calculator is allowed.
- Use a pen that writes in ink and should not be erasable.
- Do not use a red pen.
- Restrict the use of highlighters.
- No cellular phones, computers, laptops and any other related devices shall be allowed in the examination venue.

QUESTION 1

Rock Engineering

- 1.1 What rock engineering-related factors would you consider when choosing a support system for a flat, narrow, deep, tabular ore body? (5)
- 1.2 What are the reasons for hazardous conditions near faults in deep mines? How will you mitigate this as a manager? (5)
- 1.3 List five objectives of Rock Mass Classification. (5)

[15]

QUESTION 2

Mine Evaluation

You are the Manager of an underground platinum mine in the Bushveld Igneous Complex. Your Mineral Resource Manager informs you there is a problem with the Mine Call Factor (MCF) at the shaft. You know that the MCF is critical to achieving your planned grade and ounces.

- 2.1 Name any five of the factors that you will consider that may impact the MCF (list the variable components of the MCF). (5)
- 2.2 For each of the five (5) factors listed, explain briefly what controls you will put in place as the manager, to ensure the MCF improves. (5)

[10]

QUESTION 3

Underground Narrow Tabular Mining

- 3.1 Calculate the replacement factor for a conventional underground hard rock mining a layout that applies the scattered breast mining layout. Use the following parameters: (5)

Crosscut Spacing	210m
Dip of Reef	15°

Inter Level Spacing	45m
Crosscut length	180m
Traveling way length	18m
Number of Box holes per Crosscut	2
Total geological loss (known and unknown)	20%

Make the necessary assumptions regarding regional pillar support, spacing between crosscuts and mining losses.

3.2 For a deep level Conventional Gold mine, face advance relates to stoping width. Calculate the profit (per half-level) if stope face advance is 1.1m a day. Use the following parameters: (10)

Face length (m)	35
Reef width (m)	0.85
Reef value (g/t)	7.1
RD (t/m ³)	2.75
Cost per ton (R/t)	1978
Plant recovery (%)	90
Crews per half-level	8
Shifts	23

Make the necessary assumptions with regards to blast frequency, gold price and exchange rate and waste relative density.

[15]

QUESTION 4

Massive Mining

- 4.1 Discuss in detail the block caving mining method applied in underground diamond mining. (8)
- 4.2 By means of a Gantt chart show the planned activities for the development of one draw point and the respective undercut level excavations. Make use of

schematic drawings to illustrate dimensions, names, etc. Calculate the expected duration for each activity. These levels should be completed in the shortest time with the minimum delay for production start-up. (9)

4.3 What is the shortest time to complete all the development (1)

4.4 Calculate the required number of draw points and number of LHDs and dump trucks to maintain a monthly production rate of 380 000t per month. Draw point capacity is 140t per day. (2)

Note: The use of schematic sketches is allowed.

[20]

QUESTION 5

Shafts and Shaft Sinking

5.1 Vertical Shaft Sinking consists of three phases. Describe how the Pre-Sink phase is executed, taking into consideration cleaning, the limit of the phase, and safety aspects. (10)

5.2 Discuss cover drilling during shaft sinking. (5)

[15]

QUESTION 6

Large Excavations

6.1 With the use of relevant sketches, describe the method that you will follow to develop & support the excavation for a 7m diameter vertical Settler. (5)

6.2 Design the shaft bottom arrangements of a vertical shaft. Make use of relevant sketches. Discuss the spillage and dirty water handling layouts for the shaft bottom. (10)

[15]

QUESTION 7

Risk Management

There has been an increase in underground fires reported to the Department of Mineral Resources and Energy (DMRE). The fires impacted the health and safety of mine employees in some instances.

7.1 Discuss the causes of ignition of underground mine fires (5)

7.2 Discuss the procedures to be followed in a fire drill from a working place to the refuge chamber. (5)

[10]

Total Marks

[100]