

Minerals Council South Africa



CHAMBER OF MINES OF SOUTH AFRICA



EXAMINATION PAPER

SUBJECT: <u>CHAMBER OF MINES OF SOUTH AFRICA</u> <u>CERTIFICATE IN ROCK MECHANICS</u> <u>BASIC ROCK MECHANICS PRACTICE</u>	EXAMINER: MCB STANDER
PAPER 2: <u>BASIC ROCK MECHANICS PRACTICE</u>	MODERATOR: KR BRENTLEY
SUBJECT CODE: COMRMC <u>2</u>	TOTAL MARKS: [100]
EXAMINATION DATE: <u>10</u> OCTOBER 2018	PASS MARK: (60%)
TIME: 14:30 – 17:30	

NUMBER OF PAGES: 65

THIS IS NOT AN OPENBOOK EXAMINATION – ONLY REFERENCES PROVIDED ARE ALLOWED

SPECIAL REQUIREMENTS:

1. **Answer All the Questions.** Answer the questions legibly in English.
2. Write your **ID Number** on the outside cover of each book used and on any graph paper or other loose sheets handed in.
- NB:** Your name must not appear on any answer book or loose sheets.
3. Show all calculations and check calculations on which the answers are based.
4. Hand-held electronic calculators may be used for calculations. Reference notes may not be programmed into calculators.
5. Write legibly in ink on the right handright-hand page only – left hand pages will not be marked.
6. Illustrate your answers by means of sketches or diagrams wherever possible.
7. **Final answers** must be given to an accuracy which is typical of practical conditions, however be careful not to use too few decimal places during your calculations, as rounding errors may result in incorrect answers.

NB: Ensure that the correct unit of measure (SI unit) are recorded as marks will be deducted from answers if the incorrect unit is used even if the calculated value is correct.

8. In answering the questions, full advantage should be taken of your practical experience as well as data given.

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Arial, Schriftartfarbe: Automatisch

Formatiert: Überschrift 3, Trennen

Formatiert: Einzug: Links: 0,04 cm,
Erste Zeile: 0 cm

Formatierte Tabelle

Formatiert: Schriftart: (Standard)
Arial, 11 Pt.

Formatiert: Schriftart: Nicht Fett

Formatiert: Nicht Hervorheben

Formatiert: Nicht Hervorheben

Formatiert: Schriftart: (Standard)
Arial, Nicht Hervorheben

Formatiert: Nicht Hervorheben

9. Please note that you are not allowed to contact your examiner or moderator regarding this examination.
10. Cell phones are **NOT** allowed in the examination room.

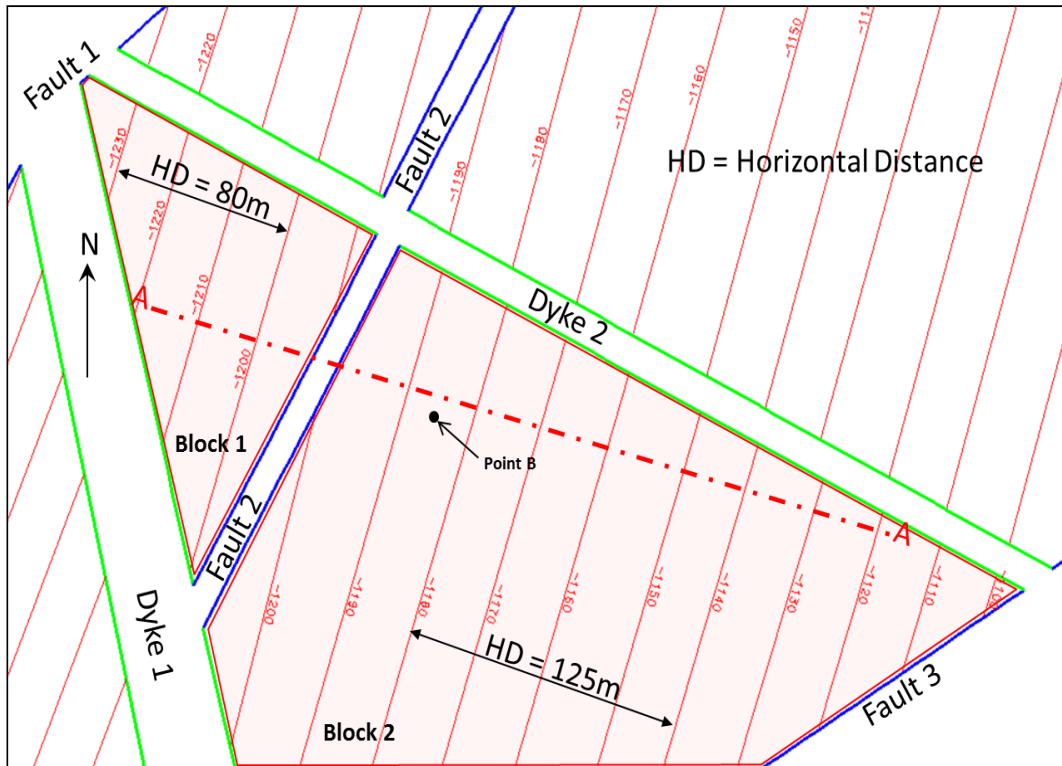
QUESTION 1. GEOTECHNICAL CHARACTERISTICS

Formatiert: Schriftart: (Standard)
Arial

1.1 | The following questions are based on the plan presented below:

Formatiert: Block

- 1.1.1. Calculate the Dip and Dip-Direction of the reef in "Block 1" and "Block 2"? (2)
- 1.1.2. Considering the plan below and with reference to Fault 2 and Dyke 2, which structure is the oldest? Substantiate your answer? (1)
- 1.1.3. A raise is planned to be developed along section line "A-A". In your answer book draw a section view along section line "A-A" to illustrate the profile of the reef and the displacement of the reef along Fault 2? (1)
- 1.1.4. With the aid of annotated sketches indicate the correct method of illustrating Dykes and Faults on a mine plan? (1)
- 1.1.5. Calculate the virgin stress at Point B. The surface elevation directly above Point B is -150 m below Datum? Clearly state any required assumptions? (1)



1.2 Describe and explain the effect of pore water pressure on rock mass strength?

(5) **Formatiert:** Block

1.3 Define the following terms **in terms**:

(4) **Formatiert:** Block

1.a) Aquifer;

Formatiert: Schriftart: (Standard)

2.b) Aquifuge;

Formatiert: Block, Mit Gliederung + Ebene: 2 + Nummerierungsformatvorlage: a, b, c, ... + Beginnen bei: 1 + Ausrichtung: Links + Ausgerichtet an: 0 cm + Einzug bei: 1,02 cm

3.c) Porosity; and

4.d) Permeability

[15]

QUESTION 2. **ROCK AND ROCKMASS BEHAVIOUR & MINE SEISMICITY**

Formatiert: Schriftart: (Standard)
Arial

2.1 A basic technique used in mapping surface or underground exposures is the scanline survey. Explain this technique and describe the features that will be recorded for each

(10) **Formatiert:** Block

discontinuity intersecting the scanline?

- 2.2 | Explain how the rockmass environment affects the velocity of P-waves and S-waves; and state typical values for velocities of P-waves and S-waves in **hard rock** environments? (5)

Formatiert: Block

[15]

QUESTION 3. FUNDAMENTAL PRINCIPLES OF MINING LAYOUTS AND MINING LAYOUT DESIGN

Formatiert: Schriftart: (Standard)
Arial

- 3.1 | With the aid of ~~of~~ an annotated sketch, illustrate the following terms: (2)

1. Reef width

Formatiert: Schriftart: (Standard)

2. Internal waste

Formatiert: Schriftart: Englisch
(Großbritannien)

3. Channel width

Formatiert: Schriftart: (Standard)

5.4. ~~and~~ Stope width.

Formatiert: Schriftart: Englisch
(Großbritannien)

Formatiert: Schriftart: (Standard)

- 3.2 | Describe the implications of mining unpayable ore against leaving ore pillars in mining situations? (5)

Formatiert: Schriftart: Englisch
(Großbritannien)

Formatiert: Schriftart: (Standard)
Arial

- 3.3 | With the aid of annotated sketches describe **two (2)** methods to avoid leaving shaft pillars? (4)

- 3.4 | Describe the origin and hazards associated with CO and H₂S?

(4)

Kommentar [P1]: Is this in the syllabus?

[15]

QUESTION 4. MINING SUPPORT AND MINING SUPPORT DESIGN

Formatiert: Schriftart: (Standard)
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4.1 With the aid of annotated sketches explain how the grouting systems of long vertical tendons may differ from long horizontal or slightly declined tendons?

Formatiert: Block

(4)

4.2 The lack of true cohesion restricts the scope for mining application of sandfill. This is overcome in practice by the addition of various cementing agents to the sand mass. List and explain **two (2)** possible problems that may result from the addition of cementing agents to sandfill?

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Formatierte Tabelle

(4)

4.3 Regulation 14.1 (6) of the Mine Health and Safety Act 29 of 1996, Mine Health and Safety Regulations states the following:

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14.1 Entering of working places

Formatiert: Schriftart: Kursiv

At every underground mine where a risk of rock bursts, rock falls or roof falls exists, and at every other mine where a significant risk of rock bursts, rock falls or roof falls exists, the employer-

Formatiert: Schriftart: Fett, Kursiv

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(6) must ensure that a quality, assurance system is in place, which ensures that the support units used at the mine provide the required performance characteristics for the loading conditions expected;

~~With regard to~~ Regarding the above regulation, discuss the factors that you would consider to ~~develop~~ developing to create an effective Quality Control System on your Mine?

(7)

[15]

QUESTION 5. INVESTIGATION AND EVALUATION

Formatiert: Schriftart: (Standard)
Arial

5.1 Explain how samples are prepared for Brazilian indirect shear strength determinations?

(5)

Formatiert: Schriftart: (Standard)
Arial

5.2 Explain how stress changes in a rock mass can be measured?

(5)

Formatiert: Schriftart: (Standard)
Arial

5.3 Explain how the placement of geophones in a seismic network could affect event location accuracy?

(5)

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Arial

[15]

QUESTION 6. DRILLING AND BLASTING

Formatiert: Schriftart: (Standard)
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6.1 Explain the effect of shock energy on rock fragmentation?

(3)

6.2 Explain the effect of gas pressure on rock fragmentation?

(3)

6.3 Explain the mechanism of rock breakage by means of a button bit?

(4)

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QUESTION 7. LEGAL COMPLIANCE AND GENERAL MANAGEMENT

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7.1 Section 11 of the Mine Health and Safety Act 29 of 1996, deals with the **Employer to assess and respond to risk**. Provide your interpretation pertaining to the overall management of risk required from the Employer?

(5)

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7.2 Section 9 of the Mine Health and Safety Act 29 of 1996, deals with Codes of Practice. In your own words, explain the required process associated with the compilation of a Code of Practice?

(10)

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[15]

Total Mark = [100]