MINERALS COUNCIL
SOUTH AFRICA

EXAMINATION PAPER

SUBJECT: CERTIFICATE IN ROCK MECHANICS **PAPER 2:** BASIC ROCK MECHANICS PRACTICE	**EXAMINER:** MCB STANDER
SUBJECT CODE: COMRMC2	**MODERATOR:** KR BRENTLEY
DATE: 12 MAY 2021	**TOTAL MARKS:** [100]
TIME: 14:30 to 17:30 (3 HOURS)	**PASS MARK:** (60%)

NUMBER OF PAGES: 4

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-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) is 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.
9. Please note that you are not allowed to contact your examiner or moderator regarding this examination.
10. Cell phones and other smart devices e.g. smart-watches are **NOT** allowed in the examination room.

QUESTION 1. GEOTECHNICAL CHARACTERISTICS

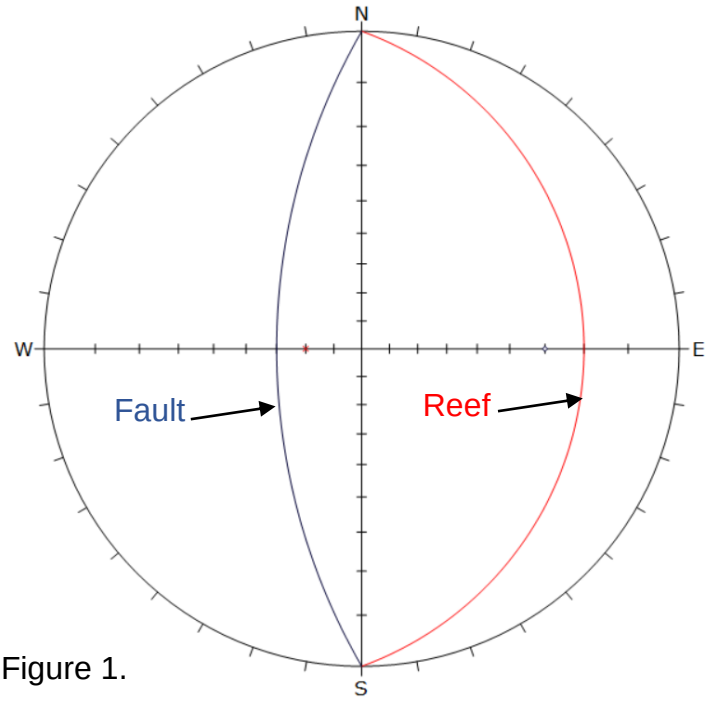
1.1 With the aid of annotated sketches, describe and explain the following geological features and/or terms? (10)

- Dykes and Sills,
- Strike and Dip,
- Potholes,
- Domes,
- Folding.

[10]

QUESTION 2. ROCK AND ROCKMASS BEHAVIOUR

2.1 With reference to the following stereonet, representing the orientation of a tabular reef horizon and fault that intersects the reef.



Symbol	DESCRIPTION	Quantity
◇	Fault	1
×	Reef	1

Plot Mode	Pole Vectors
Vector Count	2 (2 Entries)
Hemisphere	Lower
Projection	Equal Angle

Figure 1.

2.1.1 What is the **dip and dip-direction** of the fault and the reef respectively? (1)

Present your answer in a table?

2.1.2 Draw **two (2) sections**, each along the **dip-direction of the reef**, illustrating the relationship of the reef relative to the fault? (2)

- In the **first section**, indicate the relationship of the reef to the fault in the case where the fault is a **Normal Fault**?

- In the **second section**, indicate the relationship of the reef to the fault in the case where the fault is a **Reverse Fault**?

2.2 **Define Stereographic Projection** and provide reasons, **why**, stereographic projections are needed? (7)

[10]

QUESTION 3. ROCKMASS CLASSIFICATION

3.1 Provide a **comparison of the application** of **three (3)** Rockmass Classification Systems? **(Q system, RMR system and MRMR System)** (20)

[20]

QUESTION 4. FUNDAMENTAL PRINCIPLES OF MINING LAYOUTS AND MINING LAYOUT DESIGN

4.1. List and discuss **five (5)** issues that are critical and require careful consideration in the design of shaft systems with or without shaft pillars? (20)

[20]

QUESTION 5. MINING SUPPORT AND MINING SUPPORT DESIGN

5.1 Explain the concept of **Active support** and provide an example? (2)

5.2 Explain the concept of **Passive support** and provide an example? (2)

5.3 Explain the functions of Backfill as Local Support? (3)

5.4 Explain the functions of Backfill as Regional Support? (3)

5.5 **List and Briefly** describe **five (5)** factors that can be monitored to ensure that good quality backfill is placed. (10)

[20]

QUESTION 6. INVESTIGATION, EVALUATION AND MONITORING

6.1 Explain the observational method of design in rock engineering? (2)

6.2 Explain what may be learned from monitoring? (8)

6.3 Explain how one would measure the stress tensor in a rock mass? (5)

6.4 With aid of an annotated sketch, illustrate your understanding of the various components of a seismic system? (5)

[20]

Total Mark = [100]