Minerals Council South Africa

EXAMINATION PAPER

SUBJECT: CERTIFICATE IN ROCK MECHANICS **RMC PAPER 2:** BASIC ROCK MECHANICS PRACTICE **SUBJECT CODE: COMRMC** **DATE:** 11 MAY 2022 **TIME**: 14H30 TO 17H30	**EXAMINER:** MCB STANDER **MODERATOR:** S DURAPRAJ **TOTAL MARKS:** [100] **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 are **NOT** allowed in the examination room.

QUESTION 1. ROCKMASS CLASSIFICATION

1.1 When using rock mass rating systems and considering the degree of weathering of the rock mass, it is essential to evaluate the degree of weathering using the same descriptions to avoid confusion and misinterpretations. (8)

- **List five (5)** degrees of weathering that are commonly used, and
- **Explain two (2)** concerns related with the application of weathering ratings.

1.2 When conducting scan line mapping, **explain the implications and impact** of the orientation of the survey line on the interpretation of recorded data? (6)

1.3 Describe, **RMS and DRMS**, that is derived from Laubscher 's MRMR system of rockmass classification? (6)

[20]

QUESTION 2. MINE SEISMICITY

2.1 Describe the rupture processes in solid rock? (6)

2.2 Describe the rupture processes along a pre-existing fault plane? (6)

2.3 To bring order into the different failure modes, rockburst types can be classified in five (5) categories**. List any four (4) rockburst types, describe the postulated source mechanisms and provide local magnitude ranges?** (8)

[20]

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

3.1 Vertical shafts provide the access to the ore body, allowing men, material, and ore to be transported into and out of the mine and are critical to the ventilation of the mine. Damage caused by rock movement around the barrel can be the result of three (3) different processes. **With the aid of annotated sketches explain the three (3) processes and list damage criteria that is associated with the processes?** (10)

3.2 The geotechnical investigation / design / monitoring / evaluation process was designed to 'close the loop' to effectively attempt to prevent accidents from occurring underground. **Explain this process?** (10)

[20]

QUESTION 4. MINING SUPPORT AND MINING SUPPORT DESIGN

4.1 Rock reinforcement can be divided into two categories, where the first refers to the reinforcement of broken (jointed and/or fractured) rock around excavations and the second is where laminated rock layers are reinforced. **Explain how reinforcement is achieved for broken material and laminated layers.** (6)

4.2 Monitoring is the final step in the cycle of the support installation process. It is a continuous process, and should consist of three parts: (14)

- monitoring of the support material prior to installation,
- monitoring of the suitability of the overall support system underground, and
- monitoring of the quality of installations.

Explain each of the three parts listed above?

[20]

QUESTION 5. INVESTIGATION AND EVALUATION

5.1 **List five (5)** numerical modelling techniques? (5)

5.2 **Briefly explain the principles** of the numerical modelling techniques listed in your answer from 5.1? (5)

[10]

QUESTION 6. DRILLING AND BLASTING

6.1 In the period during and following the passage of a detonation wave along an explosive charge, the rock around the blast hole is subjected to the three (3) phases of loading. (10)

List and explain the three (3) phases of loading?

[10]

Total Mark = [100]