Minerals Council South Africa

EXAMINATION PAPER

SUBJECT: **CHAMBER OF MINES OF SOUTH AFRICA: INTERMEDIATE CERTIFICATE IN MINE ENVIRONMENTAL CONTROL** PAPER 1 SUBJECT CODE: **COMIMEC1** EXAMINATION DATE: **12 MAY 2023** TIME: **14:30 - 17:30 (3 HOURS)**	EXAMINER: **Mervin van Rooyen** MODERATOR: **Inus Labuschagne** TOTAL MARKS: **[100]** PASS MARK: **[60%]**

NUMBER OF PAGES: 3 including this cover page

SPECIAL REQUIREMENTS:

THIS IS **NOT** AN OPEN BOOK EXAMINATION. **THERE IS NO FORMULA HANDOUT**

INSTRUCTIONS TO CANDIDATES:

1. Answer all 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.
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, diagrams and tables wherever possible.
7. Answers must be given to an accuracy which is typical of practical conditions.

   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).

   In answering the questions, full advantage should be taken of your practical experience as well as data given.
8. Please note that you are not allowed to contact your Examiner or Moderator. regarding this examination.
9. Cell phones and other electronic devices are **NOT** allowed in the examination room.

QUESTION 1

1.1 List the Ventilation appliances found underground with a brief purpose of what they are required for. (List and describe any five, two marks per appliance with purpose). (10)

1.2 List the requirements when doing an Illumination survey. (List any five) (5)

1.3 List any five occupations at a mine and give the anticipated noise levels they will be exposed to. (5)

[20]

QUESTION 2

2.1 Draw the Fire Triangle with detail to each element. (14)

2.2 What is required from MHSA Regulation 16.6 regarding Self Contained Self Rescuers (6)

[20]

QUESTION 3

3.1 Describe the elementary laws governing the flow of air (5)

3.2 List and describe the factors causing resistance to airflow. (12)

3.3 Complete the table below on the Friction factors that can be used in air flow calculations. (half mark each) (3)

Airway	**K-Factor (Ns^2/m^4)**
Underground haulage: 3.3.1 rock lined 3.3.2 heavily timbered 3.3.3 Galvanised Vent Pipe: Concrete lined Shaft: 3.3.4 R.S.J Buntons 3.3.5 Streamlined Buntons 3.3.6 Raise Bore hole:	

[20]

QUESTION 4

4.1 A haulage of 3.6m wide x 3.0m high is 224m long. The air density is 1.1kg/m^3 and the resistance of the haulage is 0.1458Ns^2/m^8. Calculate the friction factor of the haulage. (6)

4.2 When 16m^3/s of air flows through a haulage with a resistance of 1.4 Ns^2/m^8, the pressure required is 390Pa. Calculate what the quantity would be if the pressure is increased to 620Pa at the same resistance. Ignore density changes. (4)

4.3 A fan handles 12.7m^3/s at 1.1kPa. Calculate the air power involved. (5)

4.4 Atkinson's formula is used to calculate Static Pressure, state the formula with all the factors and SI units. (5)

[20]

QUESTION 5

5.1 When electrical current is considered, give the definition and SI units for the following:

5.1.1 Current

5.1.2 Resistance

5.1.3 Potential Difference

5.1.4 Power (4)

5.2 The following data was recorded during a surface fan test:

Motor:	Volts	-	6600
	Pf	-	0.86
	Phase	-	3
	Efficiency	-	90%
Gearbox:	Efficiency	-	83%
Drive:	Efficiency	-	88%
Fan:	Efficiency	-	81%
	Quantity	-	225m^3/s @ 2.6kPa

Calculate:

5.2.1 The Fan input power (4)

5.2.2 The Motor output power (4)

5.2.3 The Amps consumed by the motor (4)

5.3 Fans are designed to specific requirements. To change the fan performance, what would be required? (4)

[20]

TOTAL MARKS: [100]