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:** **11 OCTOBER 19** **TIME**: **14:30 – 17:30**	**Examiner:** Mervin van Rooyen **Moderator:** Inus Labuschagne **TOTAL MARKS:** [100] **PASS MARK:** [60%]

NUMBER OF PAGES: 3

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 or diagrams 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 are **NOT** allowed in the examination room.

QUESTION 1

1.1 In order, to control and maintain satisfactory ventilation and thermal conditions underground, what is essentially required? (6)

1.2 Under what conditions must all work be stopped in a working place? (4)

1.3 With the increase in the degree of Mechanised Mining it creates an additional Ventilation, Health and Safety concerns. What would they be? (8)

1.4 What are the objectives in Reporting on Environmental Conditions? (2)

[20]

QUESTION 2

2.1 Draw the Fire Triangle and briefly describe the role of each component contributing to an active fire? (10)

2.2 List the requirements that need to be indicated on Mine Rescue Plans in terms of Reg.10.18, 24.13.1 and 24.13.2. (10)

[20]

QUESTION 3

3.1 Describe the principal of operation for the Cold Water Circuit used in underground refrigeration.
You can draw a sketch to assist with your answer. (8)

3.2 Describe the principle of operation for the Hot Water Circuit used in underground refrigeration.
You can draw a sketch to assist with your answer. (8)

3.3 Why would you consider underground cooling over surface cooling? (4)

[20]

QUESTION 4

4.1 Calculate the resistance of a heavy lined timber haulage, 200m long, which is 3.1m high and 2.9m wide. (5)

4.2 $68m^3/s$ of air flows in a rock-lined haulage, (3.5m by 3.2m) at a specific volume of $0.893m^3/kg$. The haulage is 257m long. Calculate:
4.2.1 The velocity pressure (7)
4.2.2 The total pressure (6)

[18]

QUESTION 5

5.1 The following data was recorded during a fan test on surface:

Motor:	Volts	-	6600
	Pf	-	0.94
	Efficiency	-	94%
	Phases	-	3
Gearbox:	Efficiency	-	90%
Drive:	Efficiency	-	91%
Fan:	Efficiency	-	85%
	Quantity	-	241m3/s @ 3.1 kPa

Calculate:

5.1.1Fan input power (4)
5.1.2 Motor input power (3)
5.1.3 Amps consumed by motor (3)

5.2 You are working on a deep level gold mine. Your line manager is concerned about the excessive costs of running the 3 main surface fans, these fans run in parallel to each other, they handle a volume of 400m^3/s at a pressure of 2.4 kPa and have a efficiency of 80%. You are further aware from your quantity surveys that 40% of all ventilation is lost in the ventilation circuit due to leakage. Assume that the electrical cost is 78c per kW/hour.

Calculate:

5.2.1 The input power to each fan (4)
5.2.2 The total running cost of these fans, per annum (3)
5.2.3 The cost of your ventilation circuit's losses per year (2)
5.2.4 You draw up a leakage reduction strategy which will cost R6 735 266 and take 120 days to complete. Determine the payback period in number of days. (3)

[22]

TOTAL MARKS: 100