

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: 09 MAY 2019 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 <u>legibly</u> in English. 2. Write your <u>ID number</u> on the outside cover of each book used and on any graph paper or other loose sheets handed in. NB: Your name <u>must not</u> appear on any answer book or loose sheets. 3. Show all calculations <u>and check calculations on which the answers are based.</u> 4. Hand-held electronic calculators may be used for calculations. 5. Write <u>legibly</u> in ink on the <u>right hand page</u> only – <u>left hand pages will not be marked.</u> 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 <u>NOT</u> allowed in the examination room.	

QUESTION 1

- 1.1 In Table form list the Advantages and Disadvantages of a Development “Forcing Ventilation System”. (8)
- 1.2 Sketch and describe the “Four Gate Ventilating System” used in ventilating a Shaft sinking operation (12)
- [20]

QUESTION 2

- 2.1 List the basic principles for a Fire Detection System. (4)
- 2.2 List and describe 3 types of fire detectors that can alarm in the case of a fire been detected in a Fire Detection System. (11)
- 2.3 What is the purpose of an “Early Warning Device” and what does the device indicate? (5)
- [20]

QUESTION 3

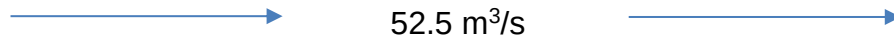
- 3.1 Explain the term “Refrigeration” (3)
- 3.2 Draw and label a simple line sketch that illustrates the “Vapour Compressor Refrigeration Cycle”. (8)
- 3.3 Complete the table below on the comparison between Condenser Cooling Towers and Cooling Coils. (9)

CONDENSOR COOLING TOWERS	COOLING COILS
Air side: 1. Air leaving the tower is at a _____ than air entering the tower 2. Air volume (m^3/s) leaving the tower is _____ than air volume entering the tower 3. Water _____ into the air	Air Side: 1. Air leaving the Cooling Coil is at a _____ than air entering the Coil 2. Air volume (m^3/s) leaving the Cooling Coil is _____ than air volume entering the coil 3. Water _____ into the air
Water side: 1. Water _____ the cooling tower is at a _____ temperature than the water leaving the tower	Water side: 1. Water entering cooling coils is at a _____ temperature than the water leaving the coil

[20]

QUESTION 4

- 4.1 The air power of a 52% efficient fan is 15.0kW. Calculate the fan electrical input power. (4)
- 4.2 $60\text{ m}^3/\text{s}$ of air at a density of $1.0\text{ kg}/\text{m}^3$ flows in a haulage with a resistance of $0.1292\text{ N s}^2/\text{m}^8$. The haulage is $3.2\text{ m} \times 3.0\text{ m}$, with a friction factor of $0.016\text{ N s}^2/\text{m}^8$. Calculate the length of the haulage. (6)
- 4.3 $8.2\text{ m}^3/\text{s}$ of air flows in a ventilation pipe with a resistance of $12.31\text{ N s}^2/\text{m}^8$. Calculate the air power (4)
- 4.4 **Line diagram of an airway**



- The pressure loss in the above airway is 720 Pa and the air density is $1.058\text{ kg}/\text{m}^3$.

What size regulator would be required to reduce the air quantity to $30\text{ m}^3/\text{s}$? (6)

[20]

QUESTION 5

- 5.1 List the type of fans used in the mining environment and give a brief description of the airflow through each. (6)
- 5.2 A fan handles $4.0\text{ m}^3/\text{s}$ at 800 Pa. The electrical input power to the fan motor is 5.0 kW and the motor output power is 4.5 kW. The fan input power is 4.0kW. (14)

Calculate :

- The Motor efficiency
- The drive efficiency
- The fan efficiency
- The overall efficiency

[20]

TOTAL MARKS: 100