

Minerals Council South Africa



EXAMINATION PAPER

SUBJECT: CHAMBER OF MINES OF SOUTH AFRICA – CERTIFICATE IN MINE ENVIRONMENTAL CONTROL PAPER 3 – ECONOMICS, PLANNING AND TECHNICAL LITERATURE SUBJECT CODE: COMMEC3 EXAMINATION DATE: 14 MAY 2025 TIME: 14:00 – 17:00 (3 HOURS)	EXAMINER: JOHAN PIENAAR MODERATOR: BILLY LETLAPE TOTAL MARKS: [100] PASS MARK: (60%)
NUMBER OF PAGES: 04 (including this page)	
<u>SPECIAL REQUIREMENTS:</u> <i>All candidates are advised to read the below instructions/requirements and adhere to them. Not adhering to them could lead to the loss of marks.</i> THIS IS <u>NOT</u> AN <u>OPEN BOOK EXAMINATION</u>. FORMULA HANDOUTS AVAILABLE - Answer all 4 questions <u>legibly</u> in English. - 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. <u>NB:</u> Your name must not appear on any answer book or loose sheets. - Show all calculations and check calculations on which the answers are based. - Hand-held electronic calculators may be used for calculations. - Write <u>legibly</u> in ink on the <u>right-hand page</u> only – <u>left hand pages will not be marked</u>. - Illustrate your answers by means of sketches or diagrams wherever possible. - Answers must be given to an accuracy which is typical of practical conditions. <u>NB:</u> Ensure that the correct unit of measure (SI unit) is recorded as marks will be deducted from answers if the incorrect or no units are used. (Even if the calculated value is correct). - Please note that you are not allowed to contact your examiner or moderator regarding this examination. - Cell phones and any other electronic devices are <u>NOT</u> allowed in the examination room. <u>Only Calculator</u> You are encouraged to make use of the CoMCert Tip-off Hotline whenever you witness or suspect any wrongdoing related to the CoMCert Examinations on landline 0800 118 998 or alternatively you can use email COMCert@tip-offs.com. This tip-off hotline and tip-off email is managed anonymously and confidentially through an independent service provider.	

QUESTION 1

- 1.1. Define a sinking fund and provide the formula used to calculate it. (5)
- 1.2. Define Present Value of an Annuity (PV) and provide the formula used to calculate it. (5)
- 1.3. Mine Ventilation Engineers often assist in drawing up the specifications of a fan and cooling plant tender.
- 1.3.1. List 10 important points that should be included for fan tenders. (5)
- 1.3.2. List 10 important points that should be included for cooling plant tenders. (5)

Total Marks: [20]

QUESTION 2

A comprehensive survey of fan repair costs has revealed the following information concerning 900 mm electric fans:

Description	Fan A	Fan B
Average cost per repair	R39,240.00	R36,400.00
Average time between repairs (months)	10	15
Cost of new fan	R180,000.00	R200,000.00

Both makes of fan have rated duties of $13.0\text{m}^3/\text{s}$ at $2,5\text{kPa}$ and fan A has been found to have an overall efficiency at this duty of 70%, while fan B has an average overall efficiency of 76%. The lives of both makes of fans are approximately the same, and average about 6 years.

- 2.1. Which of the two fans would you recommend to be purchased in future? Assume a power costs of R4.60/kWh and the present value of R1.00 per annum for 6 years at 12% is R4.11. (25)

Total Marks: [25]

QUESTION 3

3. Your mine is planning an ore replacement project in a deeper mining block of your mine. The following information is available:

- Planned reef tonnage 175 000 tonnes/month
- Mean mining depth below surface 2500m
- Average distance from shaft system 3000m

Production will come from mini-longwalls each having 8 panels, mined in series:

- Face length (per panel) 40m
- Face advance 12m / month
- Stopping / tramming width 1.5m
- Reef / waste development ratio 25m^2 / meters of development
- Rock density 2790kg/m^3

Ventilation Design Criteria:

- Heat produced from each mini-longwall 1500kW
- Air quantity required for each mini-longwall $40\text{m}^3/\text{s}$
- Heat produced from development 15kW / meter
- Reject wet bulb temperature 28.0°C
- Thermal Gradient $23.92^\circ\text{C} + 0.0192^\circ\text{C} / \text{m}$
- Ventilation Curtain from face 12.0m
- Air Utilisation 60%
- Mean density of Air 1.25kg/m^3
- Ambient Surface Temperature $18.0^\circ\text{C WB} / 30.0^\circ\text{C DB}$
- Air cooling power factor 2.07kJ/kg

- 3.1. From the parameters supplied, determine the number of mini-longwalls required to Achieve the planned reef production output (5)
- 3.2. The Code of Practice (COP) stipulates a minimum stope face velocity of 1.0m/s . Will the quantity supplied for each mini-longwall be sufficient to adhere to the COP requirements? (3)
- 3.3. Assuming an overall leakage factor of 25%, determine the massflow of air that will be required to circulate through the mine. (3)
- 3.4. Determine the total heat load produced from the mining activities and other sources. (10)
- 3.5. Determine the amount of cooling (refrigeration) required, if any. (4)

Total Marks: (25)

QUESTION 4

- 4.1. Answer the following questions based from the article “Achieving the right balance between mine scheduling and ventilation planning published in (*MVSSA Journal - Volume 78 Number 4 October /December 2025*).
- 4.1.1. Explain the key factors that must be integrated during the mine planning process to ensure sustainable and efficient mining operations. (6)
 - 4.1.2. Discuss why mine plan optimisation is challenging and explain the role of ventilation reviews in improving mine design. (5)
 - 4.1.3. Using the analogy presented in the paper, describe the role of ventilation in mine design and planning. (5)
 - 4.1.4. Identify and explain three key causes of divergence between mine planning and ventilation over the life of a mine. (6)
 - 4.1.5. Outline the key stages of the ventilation planning process as described in the paper. (4)
 - 4.1.6. Using the example of incorrectly sized raise bore holes from the case study, describe the consequences of poor collaboration between mine planning and ventilation. (4)

Total Marks: (30)