`

Minerals Council South Africa

EXAMINATION PAPER

SUBJECT: **CHAMBER OF MINES OF SOUTH AFRICA – CERTIFICATE IN MINE ENVIRONMENTAL CONTROL - PAPER 4** **SUBJECT CODE: COMMEC4** **EXAMINATION DATE: 10 MAY 2019** **TIME: 14:30 – 17:30**	**EXAMINER: R A Rabaji** **MODERATOR: A R Nundlall** **TOTAL MARKS: [100]** **PASS MARK: 60%**

Examination Instructions:

This examination question paper consists of **3** pages **FORMULA HANDOUT IS AVAILABLE**

1. Answer all questions in *English*.
2. Put your identification 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 your answers are based**.
4. Hand-held electronic calculators may be used for calculations only.
5. Write in ink on the **right hand page** only – the left hand page 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 units 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).
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. This is **NOT** an open book examination but the approved formula hand out may be used.
11. Cell phones are **NOT** allowed in the examination room

QUESTION 1

Risk Management

a) What are the four fundamental steps of Risk Management? (4)

b) List the four “T’s" of Risk Control and briefly explain the meaning of each “T*. (4)

c) List and briefly describe the two main groups of hazard sources. Give two typical examples for each source. (4)

d) What are the three different ways to layout or scope a Risk Assessment for typical mining application? (3)

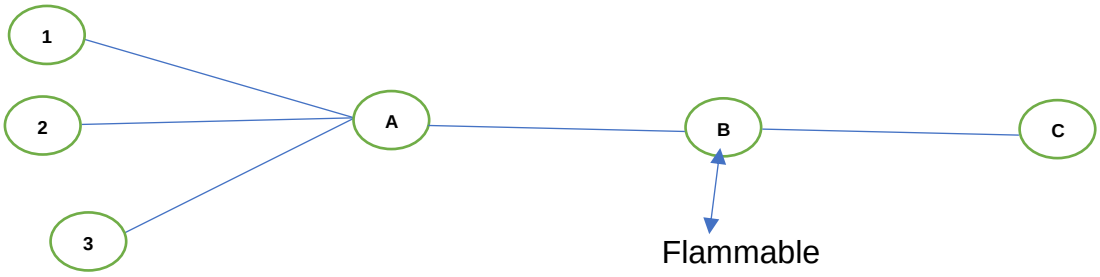
e) List five requirements that make a Continuous Risk Assessment effective (5)

[20]

QUESTION 2

Gases

(a) Three airways meet at point A. Details of the airflow are as follow:



Airway	Quantity (m^3/s	% Flammable Gas
1	5.2	Nil
2	11.1	0.6
3	9.32	1.1

At point B, a flammable gas blower emits pure flammable gas. At point C the flammable gas concentration is 0,81% after thorough mixing. Assuming that all flammable gas contents remain constant, calculate:

a) The quantity (m^3/s) of flammable gas emitted from the blower at B. (5)

b) The additional volume of air required from airway 1, which contains no flammable gas, in order to reduce the final flammable gas content at C by 30%. (5)

c) You are requested to develop a procedure for testing and removing hazardous substances from a confined space. List the basic points that you should include in such a procedure. (13)

d) Define a “Confined Space". (2)

e) List the factors affecting the formation and stability of a flammable gas roof layer. (5)

[30]

QUESTION 3

Fires and Explosions

a) Differentiate between “Explosion resistant" and “Explosion relief (2)

b) What is the rough “rule of thumb’ to determine an explosion relief panel size and which other two methods can be used? (3)

c) Describe the theory (physics) of a coal dust explosion (9)

d) List the main methods required to prevent a coal dust explosion (6)

e) A fire has been extinguished by sealing. The sealed area has a volume of 80 000m3 and the gas in the area contains 50 000 ppm of CO. If the area needs to be flushed out in 7 days, calculate the quantity of fresh air required, if a constant level of 500 ppm of CO is to be maintained at the return from this area. (7)

f) Sketch an Explosion Pentagon indicating the five essential elements that must simultaneously occur for an explosion to take place. (5)

g) List the four categories of explosions and give a typical example of each. (8)

[40

QUESTION 4

Statistics

The following CO concentrations in ppm from the various fire heads were measured after blast.

Section	2	4	6	8	10	12	14	16	18	20
CO	50	80	120	90	45	80	400	70	40	100

Calculate the following:

i) The mean CO concentration (1)

ii) The ranking of fire head 6 and 14. (1)

iii) The standard deviation (2)

iv) The geometric mean (2)

v) The median and mode of the CO values (2)

vi) Plot a frequency distribution of the CO values (2)

[10]

Total Marks [100]