



CHAMBER OF MINES OF SOUTH AFRICA

EXAMINATION PAPER

SUBJECT: CHAMBER OF MINES OF SOUTH AFRICA – CERTIFICATE IN STRATA CONTROL – METALLIFEROUS SUBJECT CODE: COMCSCM EXAMINATION DATE: 10 OCTOBER 2017 TIME: 14:30 – 17:30	EXAMINER: J. VAN ZYL MODERATOR: P. COUTO TOTAL MARKS: [100] PASS MARK: (60%)
NUMBER OF PAGES: 7	
THIS IS NOT AN OPENBOOK EXAMINATION – ONLY REFERENCES PROVIDED ARE ALLOWED SPECIAL REQUIREMENTS: 1. Answer all questions. Answer the 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. Reference notes may not be programmed into calculators. 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. Final answers must be given to an accuracy which is typical of practical conditions. However be careful not to use too few decimal places during your calculations, as rounding errors may result in incorrect answers. NB: Ensure that the correct unit of measure (SI units) 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. Cell phones are NOT allowed in the examination room.	

QUESTION 1: General

In each case, write down the **correct answer**. **Show** your calculations where required.

- 1.1 The following lengths of individual pieces of core have been recovered from a total length of drill run of 3m: 0.1 m, 0.3 m, 0.7 m, 0.3m. The RQD is
- (a) 1.4%
 - (b) 35%
 - (c) 47%
 - (d) 1%
 - (e) None of these are correct
- (2)
- 1.2 A dyke is an example of the following type of rock:
- (a) Metamorphic
 - (b) Ultra-paleo
 - (c) Igneous
 - (d) Sedimentary
 - (e) None of these are correct
- (1)
- 1.3 The mass of a rock sample is 200 kg. The sample is placed on a flat surface and an object that exerts a force of 10 N is placed on top of the rock. Assume that $g = 9.81 \text{ m.s}^{-2}$. The normal downward force (in Newtons) experienced by the flat surface is:
- (a) 1972 N
 - (b) 210 N
 - (c) 2010 N
 - (d) 190 N
 - (e) None of these are correct
- (2)
- 1.4 A method for determining the indirect tensile strength of a material is referred to as:
- (a) Geo-hammer
 - (b) Ground Penetrating Radar
 - (c) Brazilian disk
 - (d) Uniaxial Compressive Strength
 - (e) None of these are correct
- (1)

1.5 If the virgin stress is 20 MPa and the induced stress is 10 MPa, the field stress in MPa is:

- (a) 10
- (b) 30
- (c) 15
- (d) 20
- (e) None of these are correct

(2)

1.6 Calculate the δv assuming the following parameters:

$g = ?$

$h = 2250$ mbs

$\rho = \text{Platinum Mine}$

$\delta v = ?$

- (a) 70.6 KPa
- (b) 706 MPa
- (c) 70.6 MPa
- (d) None of the above

(2)

[10]

QUESTION 2: Testing and Monitoring Methods

- 2.1 Name four reasons why monitoring is required. (4)
- 2.2 Give an example of instruments that can be used to monitor in-situ load deformation characteristics of an elongate support unit. (1)
- 2.3 State the four parameters that uniquely characterise a seismic event. (4)
- 2.4 Describe two shortcomings of the Hoek-Brown criterion. (4)
- 2.5 Name and explain the operational benefits associated with seismic monitoring? (6)
- 2.6 Define the following:
- 2.6.1 Convergence (2)
- 2.6.2 Closure (2)
- 2.7 Laboratory test results are summarised in annexure 1 for a prototype elongate currently being tested on your mine. Plot the curve on the graph paper provided in the answer book and:
- 2.7.1 Clearly annotate the graph and indicate the Pre-tension, Initial stiffness, Yield force, Peak strength and Energy.
- 2.7.2 Downgrade the laboratory test results as per industry norm and plot the curve on the same chart. (7)

NB! Write only your exam number on annexure 1 and submit it with your answer book.

[30]

QUESTION 3: Support Design (20 marks)

- 3.1 From the formulae given below, name all the input parameters and basic SI units for each parameter.

(6)

$$s_z = \frac{2(1-\nu)q}{G} \sqrt{\ell^2 - x^2}$$

- 3.2 You have successfully tested and implemented the prototype unit mentioned in question 2 above at your mine. The Mine Manager has further discovered that this support unit outperforms the previous elongates used on the mine and has requested that you investigate the possibility of moving the back area barricade and sweeping standard up to 10.0m from the face due to cleaning constraints in a particular section of the mine. You also have the following workplace information of the affected area.

(14)

Depth = 2400m

Stope height = 1.1m

G = 30 GPa

V = 0.3

Rock density = 2750 kg/m³

Closure at maximum span = 102%

Support spacing = 1.5m x 1.5m

Fallout height = 1.8m

- 3.2.1 What will the closure be 10m back from the face and how will this affect the support units? Show all your calculations.
- 3.2.2 Calculate the support resistance if the support units are spaced 1.5m apart on dip and strike? **Plot your results on the same graph used for question 2.7**
- 3.2.3 Provide your manager with feedback stating if the standard can be amended or not and motivate your answer, assuming static conditions.

[20]

QUESTION 4: Pillar Support

- 4.1 Which factors need to be taken into account when designing a support system? (7)
- 4.2 With the aid of a sketch or graph, illustrate the stress deformation behavior of a Squat, Yield and crush pillar (5)
- 4.3 Give a description why we use barrier pillar`s. (3)
- [15]**

QUESTION 5: General

- 5.1 List six advantages of perimeter blasting. (6)
- 5.2 Demonstrate your knowledge of the following terms by means of a description and a sketch?
- a. Overhand mining Vs Under hand mining (3)
 - b. Sequential grid mining (4)
 - c. Sectional representation of fracturing in a narrow tabular stope with closure and ride (4)
 - d. Reverse faulting and normal faulting (4)
 - e. Stope closure recorded and plotted by a closure meter after a before and after a blast (4)
- [25]**

TOTAL MARKS: 100

Annexure 1

ID Number: _____

Table 1: Laboratory test results

Deformation (mm)	Load (kN)	Downrated Load (kN)
0	120	
25	220	
50	240	
75	265	
100	270	
125	260	
150	240	
175	200	
200	200	
225	180	
250	170	
275	160	
300	100	