

EXAMINATION PA

SUBJECT: CHAMBER OF MINES OF SOUTH AFRICA CERT. IN STRATA CONTROL (MET.) SUBJECT CODE: COMCSC EXAMINATION DATE: 24 OCTOBER 2007 TIME: 09h00 - 12h00	EXAMINER: N D FERNANDES MODERATOR: D A ARNOLD TOTAL MARKS: [100] PASS MARK: 60%
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NUMBER OF PAGES: 7

SPECIAL REQUIREMENTS:

1. **Answer ALL FIVE questions**
 2. References other than those provided are not permitted.
 3. Hand-held electronic calculators may be used.
 4. Put your examination 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.**
- 5. Write in ink on the RIGHT HAND SIDE of the paper only (only the right hand pages will be marked).**
6. Show all calculations on which your answers are based.
 7. Illustrate your answers by sketches of diagrams wherever possible.
 8. In answering these questions, full advantage should be taken wherever necessary of your practical experience as well as of the data given.
 9. Answers must be given to an accuracy that is typical of practical conditions unless stated otherwise.

QUESTION 1 – DEFINITIONS AND TERMINOLOGY

Define the following terms, giving the units of measurement

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|-------------------------|-----|
| 1.1 Dip | (2) |
| 1.2 Rock strength | (2) |
| 1.3 Force | (2) |
| 1.4 Rockburst | (2) |
| 1.5 Induced stress | (2) |
| 1.6 Closure | (2) |
| 1.7 Principal stress | (2) |
| 1.8 K-ratio | (2) |
| 1.9 Deformation | (2) |
| 1.10 Support resistance | (2) |

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QUESTION 2 – STOPE SUPPORT CALCULATIONS

Support resistance is described as the force that support is capable of applying to the hangingwall per unit area. Your mine Code of Practice prescribes two support resistance criteria, namely:

- Static Conditions 50 kN/ m²
- Dynamic Conditions 200 kN/ m²

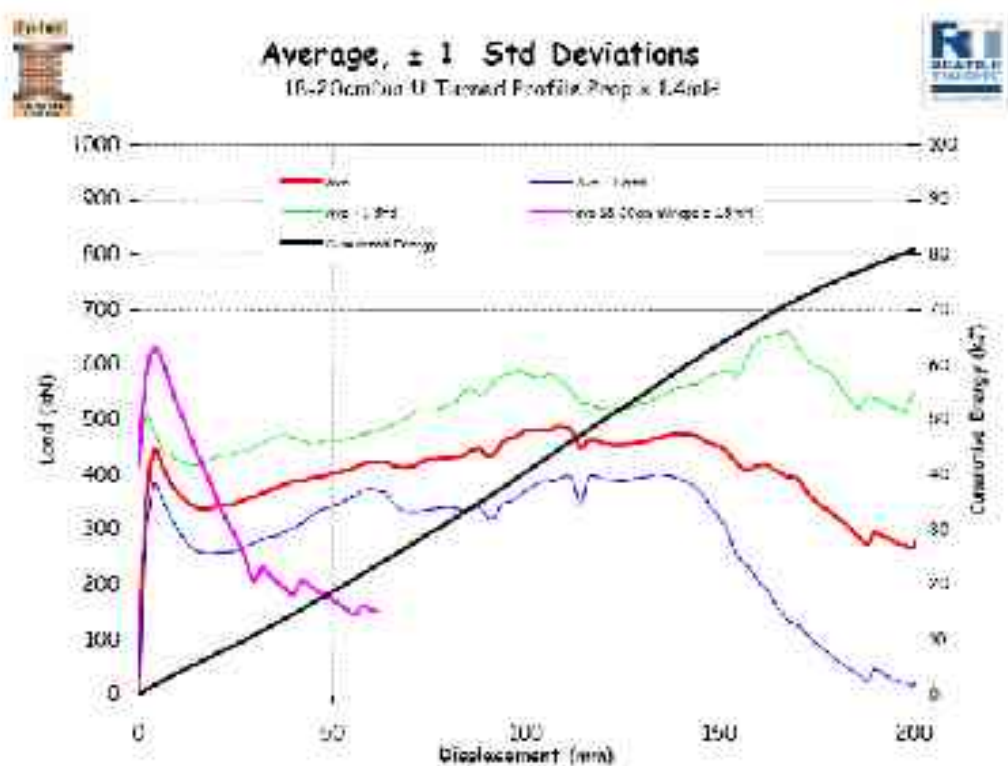
2.1 The formula for calculating static support resistance is as follows:

$$\text{Support Resistance} = \text{Force (kN)} / \text{Area (m}^2\text{)}$$

Calculate the static support resistance if props, which generate loads of 20tons (200kN) during press tests, are spaced 2,0m apart on dip and 2,5m apart on strike?

(3)

- 2.2 Calculate what the required spacing of these support units would be for the shallow areas of your mine where you only need to design for static support conditions. (3)
- 2.3 Calculate what the required spacing of these support units would be for the deep areas of your mine where you need to design for dynamic support conditions. (3)
- 2.4 The following load deformation graph is supplied with a particular type of support unit. The average load these units are able to generate is 420 kN. These support units are spaced at 2,0m on dip and 2,0 m on strike (ie. 4,0m² per unit). Calculate the support resistance that is generated under static loading conditions. (3)



conditions?
(3)

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2.6 Laboratory press test results yield the following information about a particular pack support unit:

FORCE (kN)	DEFORMATION (mm)
1000	38
2000	54
3000	70
4000	100
5000	168
6000	240

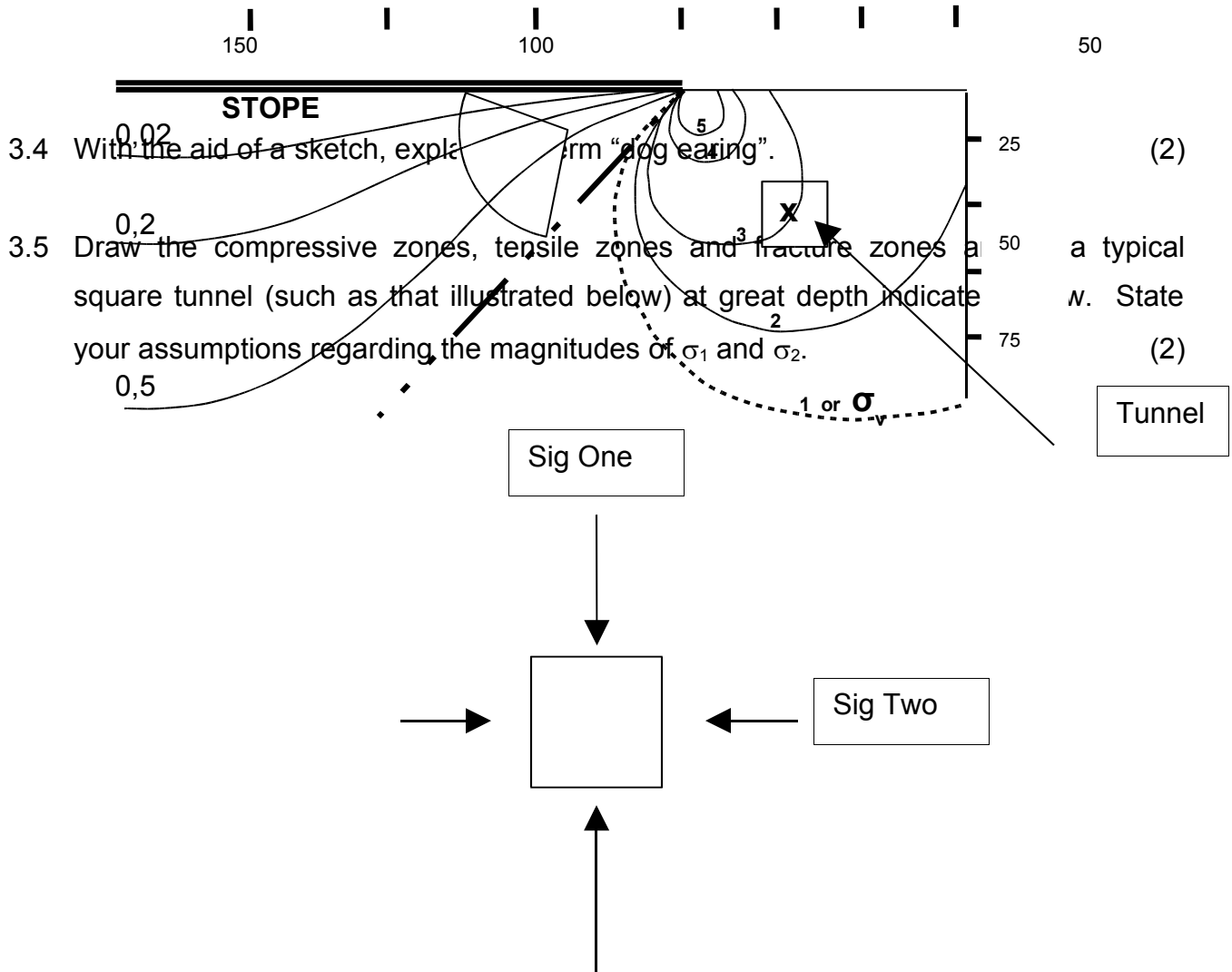
- a) The spacing of units installed on your mine is such that each pack supports 10m^2 of hangingwall. How much deformation would be measured on the pack if the dead weight created by a 10m thick hangingwall beam is to be supported? The density of the hangingwall rock is 2700 kg/m^3 . (3)
- b) What additional deformation will be experienced by the packs if the area supported per pack is increased to 16m^2 ? (2)

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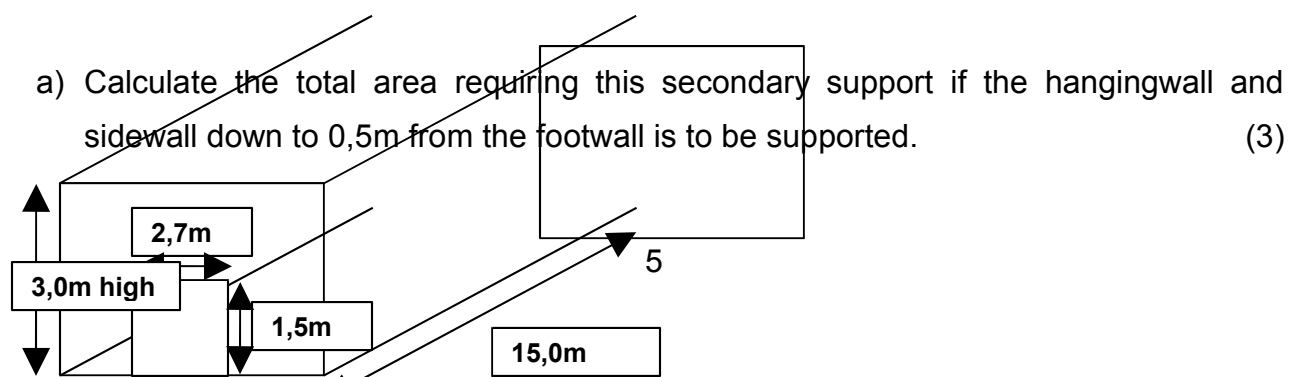
QUESTION 3 – DEVELOPEMENT SUPPORT CALCULATIONS

- 3.1 Calculate the vertical virgin stress at a point 2500m below surface. Assume that the density of the overburden rock is 2700kg/m^3 and that acceleration due to gravity is 9.81 m/s^2 . (2)
- 3.2 Name four factors that can affect the peak stress that acts on an off-reef tunnel at this depth. Briefly explain the effect of each of these factors. (4)

- 3.3 What will the magnitude of the field stress be at the position of the tunnel marked "X" in the figure below if the virgin stress is 66,2 MPa? (2)



- 3.6 The manager requires you to mesh and lace a refuge chamber that has the dimensions illustrated in the sketch below.



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- b) Calculate the cost of this support work if the labour cost is R55-00 /m², and the material cost is R85-00 /m². (3)
- c) Calculate the number of rolls of wire mesh that will be required to cover the area using the required minimum of 200mm overlap. (State your assumption regarding the width of the rolls). (2)

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QUESTION 4 – General support and designs

- 4.1 When specifying gully layouts there are nine essential dimensions which define overall gully geometry. Describe these with the aid of sketches. (9)
- 4.2 Poor blasting practice can add to gully instability problems. There are a number of key aspects in this regard. Discuss two of these. (2)
- 4.3 There are two primary sources of backfill material, namely metallurgical plant tailings and waste derived from off-reef development. Name four types of backfill that may be derived from these sources, and discuss the use of each. (4)
- 4.4 A number of factors govern the underground behavioural characteristics of packs. Name and discuss five of these factors. (5)

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QUESTION 5 – THEORY

- 5.1 The primary support system used for shallow mining operations is reef pillars left in-situ. There are four main types/classifications of these pillars, based on their width to height ratios. Describe the fundamental characteristics of these pillars, and what each type is typically used for? (12)
- 5.2 According to the Department of Minerals and Energy, mine-based rock engineers must report dangerous certain rock related occurrences.
- What types types of occurrences must be reported? (1)
 - Which forms need to be completed.? (1)
 - Describe three classes/sizes with their minimum dimensions.? (6)

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