

EXAMINATION PAPER

SUBJECT:	EXAMINER:
CERTIFICATE IN ROCK MECHANICS: PART 2	LJ SCHEEPERS
SUBJECT CODE:	MODERATOR:
COMRME	J LUCAS
EXAMINATION DATE:	TOTAL MARKS: [100]
19 OCTOBER 2011	PASS MARK: 60%
TIME: 14:30 – 17:30 (3 HOURS)	

NUMBER OF PAGES: 6

SPECIAL REQUIREMENTS:

1. **ALL candidates to answer all three Questions**
 2. References other than those provided are not permitted.
 3. Hand-held electronic calculators may be used.
 4. Write 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.

QUESTION 1 (25 marks)

You are part of a feasibility Study team for GM mining company in South Africa. Site 1 is near Witbank, Site 2 is near Rustenburg and Site 3 is near Carletonville.

Multiple Choice Questions (10 points)

- 1.1 Which resources are you most likely to find at site 1
- | | | |
|-------------|---------------|-----|
| a) Platinum | b) Coal | |
| c) Gold | d) Kryptonite | (1) |
- 1.2 Which resources are you most likely to find at site 2
- | | | |
|-------------|---------------|-----|
| a) Platinum | b) Coal | |
| c) Gold | d) Kryptonite | (1) |
- 1.3 Which resources are you most likely to find at site 3
- | | | |
|-------------|---------------|-----|
| a) Platinum | b) Coal | |
| c) Gold | d) Kryptonite | (1) |
- 1.4 Which is the most likely rock type associated with the reef package you will find at site 1
- | | | |
|----------------|---------------|-----|
| a) Sedimentary | b) Igneous | |
| c) Metamorphic | d) Kryptonite | (1) |
- 1.5 Which is the most likely rock type associated with the reef package you will find at site 2
- | | | |
|----------------|---------------|-----|
| a) Sedimentary | b) Igneous | |
| c) Metamorphic | d) Kryptonite | (1) |
- 1.6 Which is the most likely rock type you will find at site 3
- | | | |
|----------------|---------------|-----|
| a) Sedimentary | b) Igneous | |
| c) Metamorphic | d) Kryptonite | (1) |

- 1.7 Which depth category is likely to be more descriptive of site 1
- a) Deep b) Shallow
- c) Intermediate d) Open pit (1)
- 1.8 Which depth category is likely to be more descriptive of site 2
- a) Deep b) Shallow
- c) Intermediate d) Open pit (1)
- 1.9 Which depth category is likely to be more descriptive of site 3
- a) Deep b) Shallow
- c) Intermediate d) Open pit (1)
- 1.10 Choose the most likely origin of the resource likely found at site 2
- a) Organic material b) Inland see
- c) Sill-like intrusions d) Kimberlite (1)

Question 1 continue (15 marks)

- 1.11 List what geotechnical information you would gather to be used for design in your feasibility study (5)
- 1.12 Draw the load deformation graphs of a rock sample from the reef from site 1 and from site 3 on the same graph. Assume likely values and make the differences clear (5)
- 1.13 List the important considerations for preparing a rock sample for testing in a laboratory (5)

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QUESTION 2 (55 marks)

You are the shaft rock engineer at Ritzburg Gold mine. The orebody is equally distributed on 2 reefs. The RC1 reef ranges from 200m to 500m below surface. The RC2 reef ranges from 3000m to 5000m below surface. Both reefs dip at 20° to the East and are superimposed (on top of each other). Both reefs are 2m thick with the grade distributed evenly through the reef package. The reef is displaced by a series of NW to SE trending faults and stiff dykes.

- 2.1 Draw a West-East section through an area on the mine that will make the terms up-throw fault, down-throw fault, reverse fault and normal fault clear. (5)
- 2.2 List and describe the hazards associated with the faults mentioned in 2.1 for the RC1 and the RC2 (5)
- 2.3 Draw and annotate the drawing the likely fracture pattern around a stope in RC1 and in RC2 that will make the difference clear (5)
- 2.4 Design a room and pillar mining strategy for the RC1. Show all assumptions you make. Use common rules of thumb to make decisions on mining spans and use a Hedley & Grant formula to calculate the pillar width. Do the calculation for 200m below surface only. Assume no joints or other structures in your pillars. (10)
- 2.5 Design a support strategy for the RC1 List the design approach, support type and spacing and possible additional measures. (5)
- 2.6 Design a mining strategy for the RC2. Calculate the virgin stress tensor at 4km deep assuming a k-ratio of 0.5. List the most obvious geotechnical hazards associated and your strategies to deal with these hazards. (10)

- 2.7 Design a support strategy for the RC2. List the design approach, support type and spacing and possible additional measures. (5)
- 2.8 Design a monitoring program for the RC1. List the monitoring objectives and monitoring equipment required. (5)
- 2.9 Design a monitoring program for the RC2. List the monitoring objectives and monitoring equipment required. (5)

[55]

QUESTION 3 (20 marks)

- 3.1 List the long-term, medium-term and short-term Rock Engineering input required at Ritzburg Gold Mine. (5)
- 3.2 List the parameters to be included in the monthly hazard assessment at Ritzburg mine. Highlight the differences in the hazard assessment between RC1 and RC2. (10)
- 3.3 You are expected to investigate a fall of ground accident. List what you will be looking for in your investigation. (5)

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