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from: JOEL F

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WRITTEN EXAMINATION FOR THE CERTIFICATE IN STRATA
CONTROL

METALLIFEROUS OPTION

24 FEBRUARY 1999

EXAMINER:

K R NOBLE

MODERATOR:

M PRETORIUS

MAXIMUM TIME ALLOWED:

3 hours (09:00 - 12:00)

ANSWER QUESTIONS 1, 2, 3 & 5 AND EITHER QUESTION 4 OR 6

A pass mark for this paper is 60 percent.

EXAMINATION INSTRUCTIONS

1. Answer all questions in English
 2. References, other than those specified below, are not permitted.
 3. 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.
4. Show all calculations and check calculations on which your answers are based.
 5. Hand-held electronic calculators may be used.
 6. Write in ink on the right hand side of the paper only.
 7. In answering the questions, full advantage should be taken of your practical experience as well as data given.
 8. Unless stated otherwise, assume the density of quartzite is $2\,700\text{ kg/m}^3$, the Poisson's ratio is 0,2 and the modulus of elasticity is 72 GPa.
 9. In several questions not all the necessary parameters needed to complete the calculations have been given. You are required to make certain assumptions based upon your experience.

STATE WHAT ASSUMPTIONS YOU HAVE MADE AND ON WHAT THEY ARE BASED.

Forum under
free help with
exam questions

✓ QUESTION 1 *Done*

A standard uniaxial compression test was carried out on a specimen of kimberlite. The initial dimensions were 47.2 mm in diameter and 96.4 mm in length. The load-deformation record showed that the specimen deformed in a perfectly elastic manner, and that it had been compressed to a length of 96.21 mm when failure occurred at a load of 213 kN. The lateral strain at this stage was 0.00058.

Calculate:

- 1.1 The stress at failure (3)
- 1.2 The axial strain at failure (3)
- 1.3 The lateral deformation at failure (2)
- 1.4 The Poisson's ratio (3)
- 1.5 The modulus of elasticity (Young's modulus) (2)
- 1.6 The shear modulus, G (2)

[15]

QUESTION 2

A stope at a depth of 2 500 m has a stope width of 1,2 m. The rock above the stope has the following characteristics:

Density	=	2 700 kg/m ³	<i>1/2 span = 150m</i>
Poisson's ratio	=	0.25	
Modulus of rigidity	=	30 GPa	
k	=	0,3	
UCS	=	220 MPa (Uniaxial compressive strength)	

If the stope span is 300 m, calculate the following:

- 2.1 Virgin stress (1)
- ??* 2.2 The vertical stress at the face (4)
- ??* 2.3 How far into the face will no rock fracturing occur if the assumption is made that fracturing takes place at about 58% of UCS? (5)
- Residual* Do you think 58% is a realistic value?
Discuss this statement very briefly.

[10]

* QUESTION 3 *

discovers, ??? Research this

In the "Guidelines for the Compilation of a Mandatory Code of Practice to Combat Rockfall and Rockburst Accidents in Metalliferous Mines and Mines Other than Coal" the section entitled "Strategies to reduce and manage rock-related risks" forms probably the principal element of the Code of Practice.

Write detailed notes under the following strategy headings which form part of this section.

- 3.1 Mining method, sequence and overall mine stability * know this * (4)
 - 3.1.1 Shallow hard rock mines (5)
 - 3.1.2 Deep hard rock mines (2)
 - 3.1.3 The influence of mining activities on neighbouring mines (4)
- 3.2 Stope and panel support (10)
- 3.3 Monitoring and control (10)

[35]

* QUESTION 4

Blenlawski (1976) published the details of a rock mass classification system called the Geomechanics Classification or the Rock Mass Rating (RMR) system. Six parameters are used to classify a rock mass using the RMR system.

- ✓ 4.1 List the six parameters (6)

Total Rock Strength - UCS
- Point load index
- * 4.2 An excavation 10 m wide and 5 m high is located 200 m below surface and has a RMR of less than 20. Research this
 - 4.2.1 How would you excavate this excavation? Discuss excavation sequence and length of round. Use sketches where appropriate. (10)
- ✓ 4.3 What computer software would you consider appropriate in modelling a jointed rock mass? (1)
- * 4.4 In the blasting of the excavation discussed earlier in this question, what explosives would you consider appropriate and why? (8)

[25]

Research this (choose explosives)
e.g. Smoothex,

* QUESTION 5

Research this

- * Discuss the installation procedure of a 6 m untensioned grouted cable bolt of 30 mm diameter, in a vertical drill hole. Discuss the grouting procedure in detail.

[15]

✓ QUESTION 6Research this ~~done with the~~ 

Two mining systems are generally used in the deeper gold mines in order to minimise rock engineering problems at depth (2 000 - 3 500 m). These are:

- (i) The longwall mining system; and *Mining layout*
 (ii) the sequential grid mining system or (SMDP) *Mining layout*

- ✓ 6.1 Discuss the two systems with the aid of annotated and clear sketches. (10)

- ✓ 6.2 Are there any advantages in the (SMDP) or sequential grid mining system in the handling of potentially seismic faults and dykes? Discuss briefly. *geology is known & can be controlled* *planning* (5)

- ✓ 6.3 List and discuss briefly the advantages and disadvantages of the two systems. *Adv & disadv* *of over face stresses & closure rate* (10)

[25]

TOTAL MARKS: [100]

SMDP

① flexible

② geology is known

③ Easy to ventilate

④ short mining distance

⑤ short mining span

⑥ high extraction rate

LSP

Adv & disadv

① Concentrated stoping

② Easy to mechanise

③ high extraction rate

④ only one raise developed

⑤ fewer runways

⑥ off reef excavation distressed

① - inflexible

② - difficult to ventilate

③ - long mining distance

④ high closure rate

⑤ high levels of stress & seismicity

⑥ long mining span

⑦ little geology known