UNIVERSITY OF PRETORIA
DEPARTMENT OF GEOLOGY
ROCK MECHANICS GLY364

EXAMINATION: NOVEMBER 2011

Examiners: Internal: Mr U Vogler and Prof J L van Rooy
External: Mr I Breytenbach

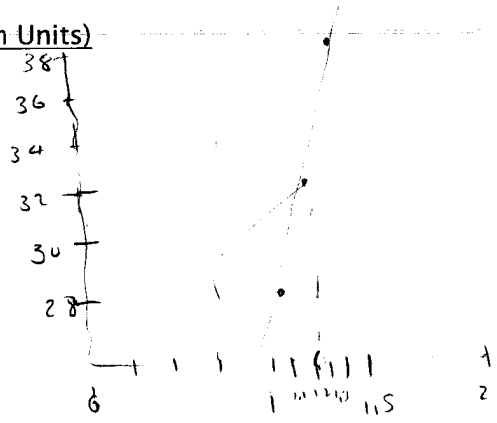
Time: 180min
Marks: 200

SECTION A
ANSWER ALL THE QUESTIONS IN A SEPARATE ANSWER BOOK/*BEANTWOORD AL DIE VRAE IN 'N APARTE ANTWOORDBOEK*

QUESTION 1 [22]
The table below presents extracts from the results obtained during a Uniaxial Compression Test on a cylindrical rock specimen numbered 123.
Note:- For simplicity the values for points 18; 19 and 20 have been chosen to ensure linear relationships.

Load at point of Failure:- 150 kN
Diameter:- 54 mm

Point	Load	Stress	Strain (Microstrain Units)	
No.	kN	MPa	Axial	Lateral
0	0	0	0	0
1	...	...	...	...
2	...	...	...	...
...	...		...	...
18	62.5		1125	115
19	75.0		1250	150
20	87.5		1375	185
...	...	...	...	...
...	...	...	...	...



Calculate:-

1.1 The UCS (Uniaxial Compressive Strength) of specimen 123. [4]
1.2 The secant modulus at 50% UCS (Esec.50%) [4]
1.3 The tangent modulus at 50% UCS (E tan.50%) [5]
1.4 The secant Poisson's Ratio at 50% UCS (vsec.50%) [3]
1.5 The Modulus Ratio (MR tan.50%) [3]
1.6 Explain briefly why the values for Esec.50% and Etan.50% differ. [3]

QUESTION 2 [15]
The following results were obtained during compression tests on two specimens of the same rock material. You may assume perfect linear behaviour. Where necessary, choose the appropriate formula (formulae) from the formulae listed below.

Specimen No.	Sigma 3	Sigma 1
01	0 MPa	100 MPa
02	20 MPa	200 MPa

Calculate/determine/write down:-

2.1 The UCS [2]
2.2 Phi [6]
2.3 C [5]
2.4 The intact shear strength [2]

$\varphi = \arcsin[(m-1)/(m+1)]$ $\quad C = K \sec\varphi$
$\varphi = \arcsin(\tan\theta)$ $\quad C = b[(1 - \sin\varphi)/2\cos\theta]$