

**UNIVERSITY OF FORT HARE**

**GLG 313  
Structural Geology  
South African Geology**

**Special Supplementary Examinations: January 2019**

**Time: 3 Hours**

**Marks: 100**

**Subject: Geology**

**One paper**

This paper consists of 3 pages including the cover pages

Internal Examiners:

External Examiner:

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**INSTRUCTIONS**

**Answer two (2) questions from each of Section A and B**

## SECTION A: STRUCTURAL GEOLOGY

### QUESTION 1

[25]

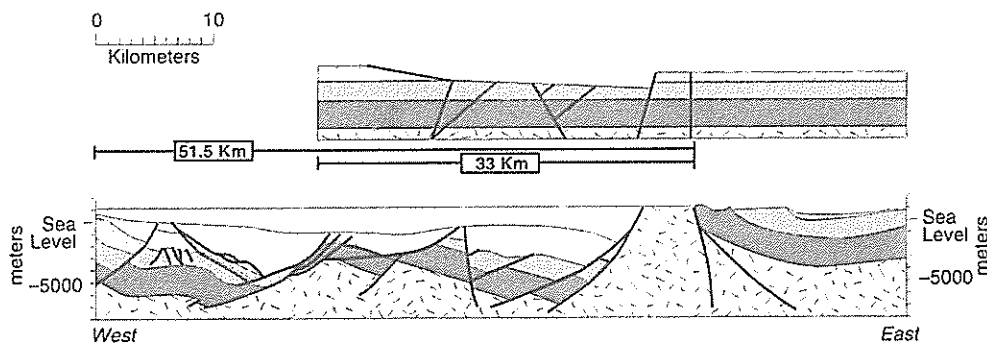
a) Stereographic projections are used in geology to present three-dimensional orientation data in two-dimensional space for geometric elements (such as bedding planes, fault planes, foliations, and lineations). They are extremely fast and useful techniques to solve structural problems. 12.5

Explain in your own terms how can one plot the following:

- a fault with an attitude of 65/25; 65 is the strike and 25 is the dip angle
- a lineation with a trend of N40E and a plunge of 30 SE
- how to find the trend and plunge of the intersection of two fault planes
- how to plot a pole of a fault N60E/ 35SE and  $\sigma_1$  and  $\sigma_3$  acting on this fault

b) The strain can be expressed in terms of shear strain ( $\gamma$ ), elongation ( $e$ ), quadratic elongation ( $\lambda$ ), and stretch ( $s$ ) etc. 12.5

Observe the image below and calculate  $e$ ,  $\lambda$ , and  $s$  for extensional tectonics, and draw the stress and strain ellipse.



### QUESTION 2

[25]

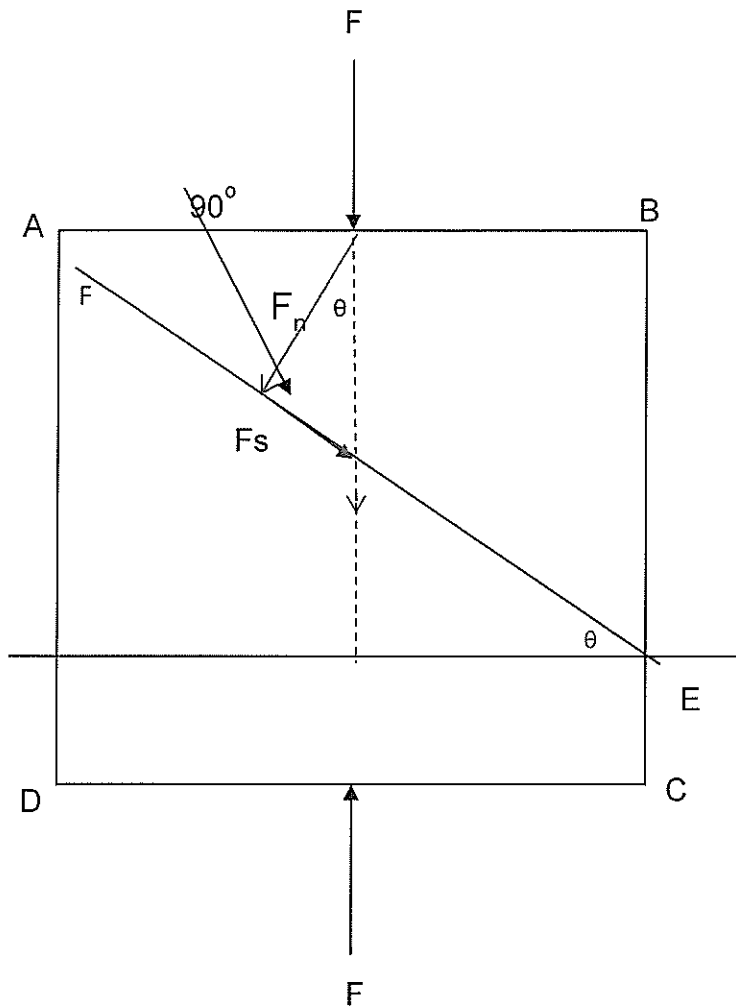
Give an account on the ductile shear zone in most regions around the world; your account should include an introduction, an illustration of an integrated model for a displacement zone that cuts deep into the crust, and shear-sense indicators (the two types of grain-tails complexes).

### QUESTION 3

[25]

a) With the aid of diagrams/drawings, explain Mohr circle (incorporating also the uniaxial, biaxial, triaxial, pure shear stress and the hydrostatic pressure. [15]

b) Refer to the diagram below and derive the normal stress and the shear stress. [10]



**SECTION B: SOUTH AFRICAN GEOLOGY**

**QUESTION 4** **[25]**

- a) List the stratigraphic sequence and main lithologies of the Cape Supergroup, and further discuss the depositional environments of the Cape Supergroup deposits. **[12.5]**
  
- b) Discuss the stratigraphic sequence and main lithologies of the Natal Group, and explain the tectonic setting and depositional environment for the Natal Group sediments. **[12.5]**

**QUESTION 5** **[25]**

- a) With the aid of table, list the stratigraphic sequence and main lithologies of the Karoo Supergroup in the Eastern Cape Province, and discuss the depositional environments and the climate change during the formation of the deposits. **[12.5]**

b) With the aid of table, list the stratigraphic sequence and main lithologies of the Witwatersrand Supergroup, and discuss the depositional environments and the ore-deposits hosted in the Witwatersrand Supergroup. [12.5]

**QUESTION 6** [25]

Give an account on the Pongola Supergroup. Explain the tectonic setting, stratigraphic sequence, depositional environments, and developmental history during the deposition of the Pongola Supergroup.