NATIONAL UNIVERSITY of SCIENCE AND TECHNOLOGY

FACULTY of APPLIED SCIENCES

DEPARTMENT of APPLIED PHYSICS

BSc. PART III (SES)

STRUCTURAL GEOLOGY

SES 4105

First Semester Examination Paper

December 2024

This examination paper consists of **3** printed pages

Time Allowed : **3 Hours**

Total Marks : **100**

Special Requirements : **None**

Examiner : **Mr. J. M. Zulu**

INSTRUCTIONS

ANSWER ALL PARTS OF QUESTION 1 IN SECTION A AND ANY THREE QUESTIONS FROM SECTION B. SECTION A CARRIES 40 MARKS AND SECTION B CARRIES 60 MARKS.

MARK ALLOCATION

QUESTION	MARKS
1.	**40**
2.	**20**
3.	**20**
4.	**20**
5.	**20**
Maximum possible mark	**100**

SECTION A

1 a.) i) What is a geological map? [2]

ii) What is the purpose of a cross section in geological mapping? [3]

b.) Briefly explain the mechanisms of brittle and ductile deformation of rocks. [5]

c.) Compare and contrast joints and fractures in a rock formation. [5]

d.) i) Define the term stress. [1]

ii) Outline any two forces that cause deformation of rocks in the Earth's crust. [4]

e.) What are geological structures? [5]

f.) Describe structural controls on igneous rocks intrusion emplacement. [5]

g.) Define the term strain with reference to deformation of unit cube rock body in a stress field.

Illustrate your answer with the aid of a well labelled diagram. [1, 4]

h.) Describe the relationship between fractures and mineral deposits. [5]

SECTION B

2 a.) With the aid of a well labelled diagram, explain the meaning of the term unconformity. [5]

b.) What is the significance of the occurrence of an unconformity in an area when carrying out geological mapping? [8]

c.) i) What is paleostress analysis? [2]
ii) Explain the importance of paleostress analysis. [5]

3 a.) Describe the formation of faults and folds. [10]

b.) With the aid of a well labelled diagram, describe the characteristics of a normal fault. [5]

c.) How do faults and folds affect groundwater flow? [5]

4 a.) Explain the relevance of structural geology mineral exploration and mining operations. [10]

b.) Outline the significance of structural geology in sedimentary and metamorphic petrology. [10]

5 Discuss the importance of structural geology in the design of the following civil engineering structures:

(i) Dams [10]

(ii) Construction of a pipe line from Gwayi-Shangani Dam to Bulawayo. [10]

6 Explain the role of structural geology in the following:

i) Geotechnical hazard assessment. [5]

ii) Tunnel design. [5]

iii) Hydrogeological hazard assessment. [5]

iv) Hydrocarbon exploration. [5]

END OF EXAMINATION