FACULTY OF ENGINEERING AND THE ENVIRONMENT

DEPARTMENT OF MINING ENGINEERING

FUNDAMENTALS OF GEOLOGY

EMN 2106

Final Examination Paper

November/December 2024

This examination paper consists of 4 pages

Time Allowed: **3 hours**

Total Marks: **100**

Examiner's Name: **Mr N Ndlovu**

INSTRUCTIONS

1. The examination consists of SIX questions, Answer **QUESTION 1** and **ANY OTHER THREE QUESTIONS**
2. Each question carries 25 marks.
3. Answer each question on a new page and write as eligible as possible

Additional Requirements

NONE

MARK ALLOCATION

Question 1 to 6	**25 Marks**
Part Questions	**As shown in each part question**
Total Attainable	**100**

Question 1 (Compulsory)

a. How is Geology related to Mining Engineering? Discuss the scope of application of geological knowledge in the Mine Value Chain. [15]

b. Magma is hot molten material found in within the earth's interior from the melting of the upper mantle and lower crust. Explain the processes of magma formation, incorporating the processes that cause the asthenosphere to melt. [10]

Question 2 Igneous rocks

a**.** Write detailed notes on the following:

(i) Composition and types of magma [10]

(ii) Texture of igneous rocks based on their granularity [10]

b. With the aid of explicit examples, differentiate between intrusive (plutonic) and extrusive (volcanic) igneous rocks. [5]

Question 3 Metamorphic rocks and Plate Tectonics

a. There are three major types of metamorphic textures. Create a table that links these metamorphic textures to the rocks that exhibit each texture. [6]

b. Write detailed notes on the following:

(i) Types of metamorphism [10]

(ii) Agents of metamorphism [9]

Question 4 Earth's Internal Structure

a. Seismic waves are waves of energy that travel through the Earth's layers and are a result of earthquakes, volcanic eruptions, magma movement, large landslides and large man-made explosions that give out low-frequency acoustic energy. Explain the seismic waves and how they propagate through the Earth's layers. [6]

b. Describe the internal constitution of the earth with the help of clearly labelled diagrams [6]

c. Compare the continental and oceanic crust in terms of the average density, thickness and rock type. [6]

d. The core is divided into the inner and outer core. If the inner core is solid, explain why the outer core molten. [2]

e. The study of geology and processes that shape the Earth are an essential component for a mining engineer. Give reasons. [5]

Question 5 Sedimentary rocks

a. With the aid of a diagram(s), illustrate sediment transportation system, with the processes that occur as sediments are moved in a fluvial system. Link with fluvial deposits. [10]

b. Sediments undergo lithification as they get buried. Explain lithification and the processes that contribute to lithification. [3]

c. Write short notes on the following:

(i) Clastic and non-clastic sedimentary rocks noting an example of each as well as typical minerals [8]

(ii) Graded bedding [4]

Question 6 Mass wasting, weathering, and denudation

a. State and explain the factors that affect weathering. [6]

b. Concisely describe mass wasting and explain any three varieties of mass wasting processes. [6]

c. List four mechanisms responsible for triggering mass wasting processes. [4]

d. What is weathering? Enumerate the various mechanisms of rock weathering. Describe chemical weathering in detail. [9]

Question 7 Hydrogeology and soil formation

a. Briefly describe the three sources of groundwater. [6]

b. Define, with the aid of examples, the following terms used in hydrogeology. [6]

   i. Aquifer [2]

   ii. Aquiclude [2]

   iii. Aquitard [2]

c. Describe the stages for the formation of a soil profile. [5]

d. Define ground water? Write an essay on origin and distribution of ground water. [8]

End of exam