



**FACULTY OF ENGINEERING AND ENVIRONMENT
DEPARTMENT OF METALLURGICAL ENGINEERING
DEPARTMENT OF MINING ENGINEERING**

GEOLOGY FOR ENGINEERS

EMR/EMI 2102

Final Examination Paper

January 2019

This examination paper consists of 4 pages

Time Allowed: 3 hours

Total Marks: 100

Examiner's Name: Mr. N Ndlovu

INSTRUCTIONS

1. This question paper consists of 6 questions, answer **ANY FOUR 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	25Marks
Part Questions	As shown in each part question
Total Attainable	100

Question 1: Earth's structure and Plate tectonics {25 marks}

1.1 Copy and accurately fill the table below. [6]

Type of crust	Density	Composition(minerals)	Composition(rocks)
Continental crust			
Oceanic crust			

1.2 What is convection? Explain mantle convection. [4]

1.3 List five evidences that support the Theory of Continental drift. [5]

1.4 Why is the oceanic crust recording much younger age than the continental crust? [4]

1.5 What are the three plate boundary interactions? What landforms form in each? [6]

Question 2: Igneous and metamorphic petrology {25 marks}

2.1 With the aid of a diagram, explain the Bowen's reaction series. [7]

2.2 What are the three components of a magma? [3]

2.3 List any 6 textures of igneous rocks. [3]

2.4 Explain the principal factors that drive metamorphism. [6]

2.5 What is foliation? How does it form? [4]

2.6 List five rocks in order of increasing metamorphic grade. [2]

Question 3: Sedimentary Petrology {25 marks}

3.1 There are three types of sediments that lead to the formation of sedimentary rocks. Copy and fill in the table below. [6]

Types of sediments	Environment found
1.	
2.	
3.	

3.2 Briefly describe the transportation process of clastic sediments and the type of sediment movement within a river system. [5]

3.3 After deposition of sediments by the different depositional agents, sediments undergo lithification to become hard rock. Explain lithification and the processes that occur. [3]

3.4 What is the difference between arenites and lutites? Give examples of rocks. [4]

3.5 What is dolomitization? Where does it take place? [2]

3.6 Explain the formation of an alluvial fan. [3]

3.7 List four marine depositional environments. [2]

Question 4: Mass wasting, weathering, and denudation {25 marks}

4.1 Briefly describe mass wasting and list three types of mass wasting processes. [6]

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

4.3 Define weathering and list four environmental factors affecting the rate of weathering. [5]

4.4 Explain the process of salt crystallization in the weathering of rocks. Give an example of a salt that usually acts on rocks during this process. [3]

4.5 What are the five agents of chemical weathering? [5]

4.6 Explain the term denudation. [2]

Question 5: Hydrogeology, erosion and soil formation {25 marks}

- 5.1 Describe how a soil profile is formed from the parent rock. [3]
- 5.2 What is erosion? [2]
- 5.3 How does climate affect erosion? [4]
- 5.4 What are the three sources of groundwater? [3]
- 5.5 Explain porosity and permeability, and explain how the two are connected in terms of aquifer recharge and discharge. [4]
- 5.6 With the aid of a diagram, explain the hydrological cycle. [6]
- 5.7 Name a rock that can be a good aquifer and list the two purposes of an aquifer. [3]

Question 6: Miscellaneous

- 6.1 With a fully labelled diagram, illustrate and explain the lithological cycle. [8]
- 6.2 Define a mineral. [4]
- 6.3 Draw a diagram showing the lithosphere and its components, including the Moho. [5]
- 6.4 Differentiate between the vadose and phreatic zone. [4]
- 6.5 Differentiate between leucocratic and mesocratic minerals, giving examples of minerals that fall in each category. [4]