FACULTY OF ENGINEERING AND THE ENVIRONMENT

DEPARTMENT OF GEOMATICS AND SURVEYING

GEOLOGY

ESG 3210

Final Examination Paper

April 2024

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; Interior and properties** {25 marks}

1.1 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]

1.2 With the aid of a well annotated diagram, describe the Earth's internal structure. [6]

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

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

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

Question 2: **Earth's Gravity and Magnetic field** {25 marks}

2.1 Explain Newton's law of Universal Gravitation. [3]

$$F = G\frac{Mm}{2}$$

2.2 State Newton's second law of motion and write down the formula. [2]

2.3 What is the gravitational field? [2]

2.4 Describe three factors that affect gravity measurements on the Earth. [6]

2.5 Describe the three components of the Earth's magnetic field. [6]

2.6 Draw and label the geomagnetic elements. [4]

2.7 What do the terms remanent and induced magnetizations mean? [2]

Question 3: **Igneous and metamorphic petrology** {25 marks}

3.1 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. [9]

3.2 Catalogue and elucidate the components of magma. [6]

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

3.4 With the aid of a diagram(s), explain the formation of the foliation texture in metamorphic rocks. [4]

Question 4: **Mineralogy and sedimentary petrology** {25 marks}

4.1 Explain isotropism, polymorphism and cleavage as applied in physical properties of minerals. [6]

4.3 Elucidate on the importance of mineral hardness as applied to Surveying. [9]

4.4 With the aid of a diagram(s), illustrate sediment transportation system, with the processes that occur as sediments are moved in a fluvial system. What role to sedimentary rocks play in surveying for minerals? [10]

Question 5: **Continental Drift, Seafloor Spreading and Plate tectonics** {25 marks}

5.1 What are the different types of plate boundaries and what geological features do they create? Use diagrams where possible. [6]

5.2 Give reasons as to why the oceanic crust rock younger at the mid-ocean ridges than at the ocean trench? [6]

5.3 What is the cause or what drives plate tectonics? [5]

5.4 Discuss the role of tectonism in shaping the Earth and the effects it has on survey instrument [8]

Question 6: **Atmosphere, Hydrosphere, and Biosphere** {25 marks}

6.1 What is the atmosphere, its role, and composition? [5]

6.2 List the three properties of the Earth's atmosphere. [3]

6.3 Define weather and list five measurable parameters of weather. [4]

6.4 With the aid of a clearly labelled diagram, explain the Hydrological cycle. [6]

6.5 Elucidate on the different biomes found in Zimbabwe and hence briefly explain the savanna biome with respect to climate, flora and fauna. [7]