FACULTY OF ENGINEERING AND THE ENVIRONMENT

DEPARTMENT OF GEOMATICS AND SURVEYING

EARTH SCIENCES

EGS 2103

Final Examination Paper

June 2020

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 SECTION A and SECTION B. Answer question 1 on section A and 3 questions on section B.
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 7	**25Marks**
Part Questions	**As shown in each part question**
Total Attainable	**100**

SECTION A (COMPULSORY)

Question 1.

1.1 Explain, with given examples, the role of geophysics in the geomatics and surveying field. [10]

1.2 With the aid of named specific rocks, describe the challenges faced by surveyors as they undertake measuring and recording field measurements. [10]

1.3 Clarify the role of earthquakes and volcanoes in shaping and creating the landforms on the Earth's surface. [5]

SECTION B (ANSWER ANY THREE QUESTIONS)

Question 2: **Earth's structure; Interior and properties** {25 marks}

2.1 Explain the Earth's interior with reference to the layers, sub layers, composition, temperature and pressure. [8]

2.2 Eight elements are abundant in the crust. List the 5 most abundant elements in the Earth's crust in order of abundance. [5]

2.3 Explain the source(s) of the Earth's interior heat. [4]

2.4 Differentiate between the continental and oceanic crust. [6]

2.5 Contrast between the lithosphere and the asthenosphere. [2]

Question 3: **Earth's Gravity and Magnetic field** {25 marks}

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

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

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

3.3 What is the gravitational field? [2]

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

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

3.6 Draw and label the geomagnetic elements. [4]

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

Question 4: **Igneous and metamorphic petrology** {25 marks}

4.1 With the aid of a fully labelled diagram, explain the rock cycle. [8]

4.2 What are the three sources that melt the asthenosphere in the formation of magma? [3]

4.3 List and explain the three factors that drive metamorphism. [6]

4.4 Metamorphic rocks are classified by their texture and composition, which also related to grade. List the metamorphic rocks from low grade to high grade. [3]

4.5 With the aid of a diagram(s), explain the formation of the foliation texture in metamorphic rocks. [5]

Question 5: **Mineralogy and sedimentary petrology** {25 marks}

5.1 Define a mineral. [2]

5.2 List and explain three physical properties of minerals. [6]

5.3 List the minerals, from softest to hardest, in the Mohs Hardness scale. [5]

5.4 Describe the process of sedimentary rock formation, naming the type of sediments that are involved. [6]

5.5 Coal is formed, not from marine organisms, but from the remains of land plants. Describe the process of coal formation with reference to all the stages or processes that take place. [6]

Question 6: **Continental Drift, Seafloor Spreading and Plate tectonics** {25 marks}

6.1 Elucidate on the historical evidence that gave rise to the theory of plate tectonics? [5]

6.2 Explain how earthquakes and volcanoes are related to plate boundaries. What mechanisms are responsible for this tectonic activity? [6]

6.3 Why is the oceanic crust rock younger at the mid-ocean ridges than at the ocean trench? [3]

6.4 What is the cause or what drives plate tectonics? [3]

6.5 Briefly explain seafloor spreading? [2]

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

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

Question 7: **Atmosphere, Hydrosphere, and Biosphere** {25 marks}

7.1 What is the atmosphere, it role, and composition? [5]

7.2 State the three properties of the Earth's atmosphere. [3]

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

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

7.5 List the three biomes found in Zimbabwe. [3]

7.6 Biomes are defined by their unique vegetation and animal life. Briefly explain the savanna biome with respect to climate, animals, and vegetation. [4]