MANICALAND STATE UNIVERSITY

OF

APPLIED SCIENCES

FACULTY OF ENGINEERING

**MINING AND MINERAL PROCESSING ENGINEERING DEPARTMENT**

**ENGINEERING GEOLOGY**

**CODE: HMIE 512**

**SESSIONAL EXAMINATIONS**

**MAY 2019**

**DURATION: 3 HOURS**

**EXAMINER: S.SIBANDA**

## INSTRUCTIONS

1. *Answer Section A*
2. *Answer any* ***three (3)*** *questions from Section B.*
3. *Each question carries 25marks.*

**SECTION A (compulsory)**

**Question 1**

Figure 1 (insert), shows three points A, B and C, where the base of shale and the base of the underlying ironstone were intersected at depth (see borehole data table on the bottom left corner of the map).

(a) Draw structural contour lines for the contacts on the western side of the map. **[4]**

(b) Workout the orientation of the contacts. **[6]**

(c) Draw a cross section passing through point B, along an east-west line. **[5]**

(d) With the aid of diagrams explain the factors that affect outcrop width. **[6]**

(e) Why is it critical for an engineer to understand a geological map? **[4]**

**SECTION B**

**Question 2**

1. The classification of rocks is as important to the engineer as it is to the geologist. Explain why this is important from an engineer’s perspective giving examples were possible. **[10]**
2. With the aid of diagrams distinguish between the following paired terms as they are applied in engineering geology:

(i) Intact rock and rock mass **[4]**

(ii) Spacing and separation of discontinuities. **[4]**

(iii) Isotropy and inhomogeneity **[4]**

1. Calculate the point load index, Is, given the following test data;

Sample: sandstone

NX diameter (d) core (70 mm)

Force (P) at failure = 24.26 x 106 kN **[3]**

**Question 3**

1. Engineering classification of the three major classes of rocks depends on certain characteristics of the rock type. Briefly describe the major characteristics for the **three** classes and give examples of the rock types for each. **[9]**
2. Rock mass quality classifications are based on the interaction of **three** major properties. Briefly describe these **three** properties and how they influence rock mass quality. **[9]**
3. List any **four** geological properties that individually or combined govern the physical resistance of aggregate to crushing, abrasion, volume change and chemical decomposition.  **[4]**
4. How does the orientation of joints affect the stability of underground mine workings?  **[3]**

**Question 4**

Site investigations are an integral part of engineering geology practice. Briefly explain the purpose of site investigations, the critical stages involved and its objectives, citing an engineering case scenario of where it was applied and served its purpose.  **[25]**

**Question 5**

1. Intense Tropical Cyclone Idai was one of the worst tropical cyclones on record to affect Africa and Southern hemisphere. The long lived storm caused catastrophic damage in Mozambique, Zimbabwe and Malawi.
   1. Briefly explain the causes of the massive rock falls and mudslides that occurred during this cyclone, with reference to Zimbabwe. **[10]**
   2. Is there anything that could have been done to mitigate or reduce the impact of mass wasting that occurred during this catastrophic event, with reference to Zimbabwe? **[5]**
2. The origin of fractures maybe related to the geological history of an area. List any **four** diverse geological origins of fractures. **[4]**

(c) What is the purpose of a discontinuity survey? **[6]**

**END OF QUESTION PAPER**