GGY 3051 – Assignment 1: Due: 25nd May, 2023 17:00 hrs

- Plate Tectonics
- Minerals
- Rocks
- Factors Affecting Strength of Rocks in Engineering Practice
- Geological Structures
- Industrial & Construction materials
- Site Investigations

1.

a)

i. What are the five decisive properties that define a mineral?
ii. Mention three main classes of rocks and the criteria used to categorize rocks into these three classes?
iii. List two examples of rock types in each of the three main classes of rocks mentioned in (ii)
iv. Comment on the structure and texture of the rocks in each of the rock classes in (ii)

b)

Rocks that originate from solidification of molten magma occur either as extrusive or intrusive bodies. Briefly explain:

i. The main mode of occurrence of extrusive rocks and intrusive rocks
ii. How and why textures of these two groups or rocks differ

2.

Rocks are involved in many civil engineering projects and rock is characterized in terms of Intact Rock and Rock Mass:

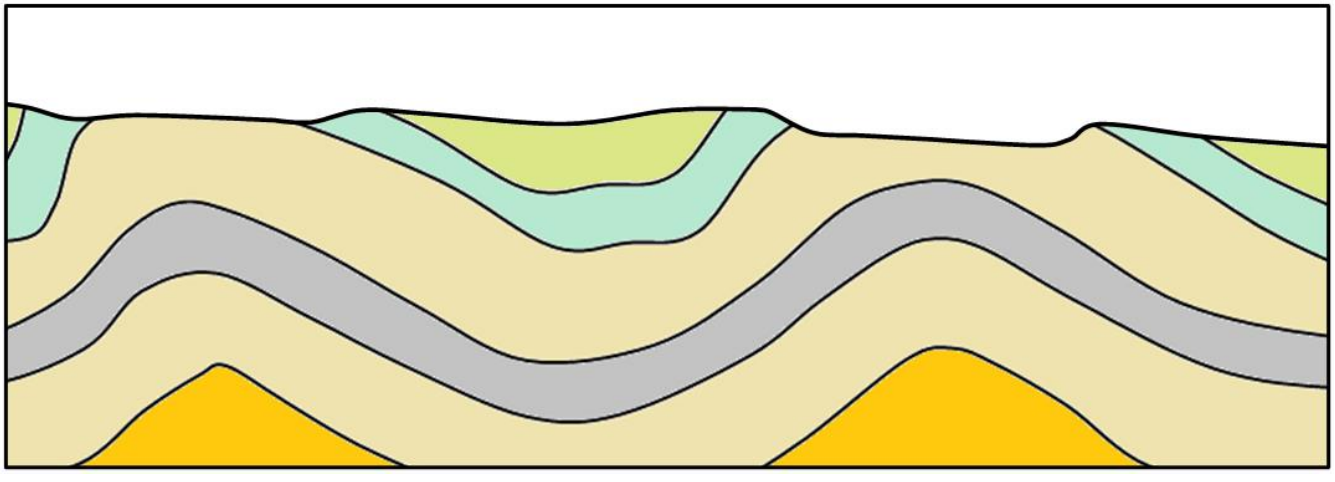
i. Mention three types of deformation that an intact rock may undergo and briefly explain what happens in each type of deformation
ii. Explain the difference between elastic strain and plastic strain.
iii. Distinguish between Intact Rock Strength and Rock Mass Strength
iv. List some of the factors that influence whether a rock will deform in elastic or plastic manner or break when placed under stress.

3.

a) Mention three types of direct stresses caused by tectonic forces/ processes and the type of plate boundaries likely to cause each type of stress

b) What type of stress creates folds?

i. Describe the geological structures anticline and syncline and how they are formed
ii. Mention three geometrical features of a fold
iii. Mention two main types of folds and give two examples of each
iv. Label the types of folds the diagram below, and important geometrical features of the folds.

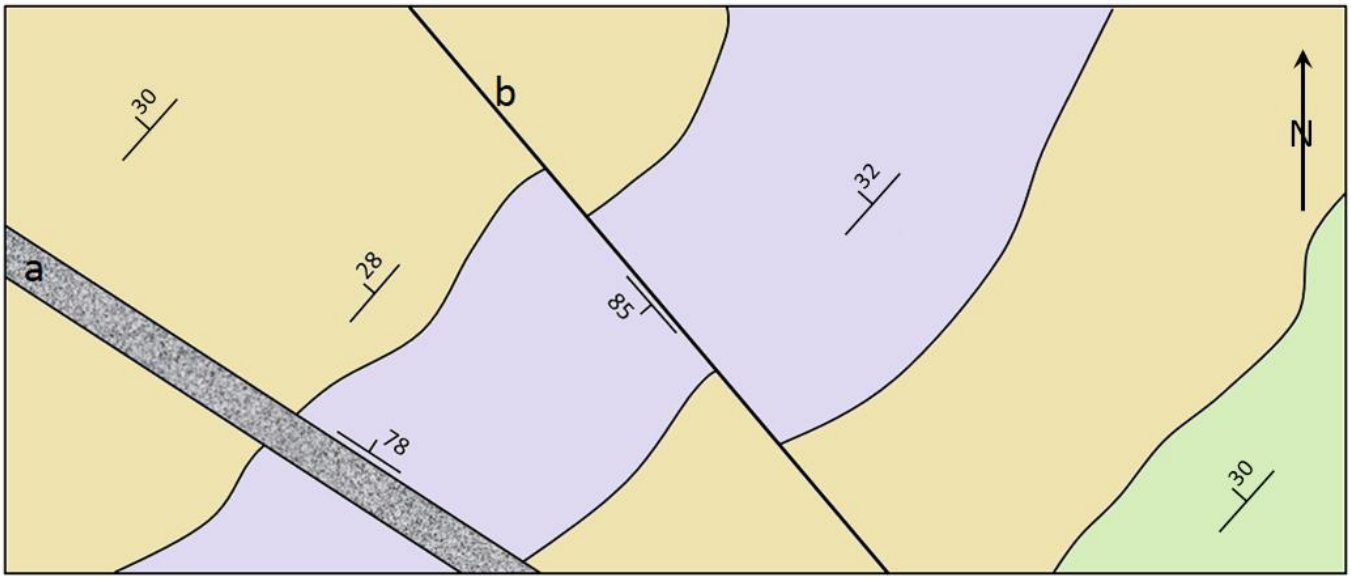


c) Give geological descriptions of the three types of fault movements and or provide simple sketches to illustrate your explanation if you need to.

d) What is the difference between a normal fault and a reverse fault, and under what circumstances would you expect these faults to form? In each case state the kinds of stress involved and what happens to the earth's crust.

e) What type of fault would you expect to see near to a transform plate boundary?

f) The diagram below is a plan view (map) of the geology of a region. The coloured areas represent sedimentary beds.



i. Describe in words the general attitude (strike and dip) of these beds.

i. Which of these beds is the oldest?
ii. What is “a” and what is its attitude?
iii. What is “b” and what is its attitude?
iv. Which of these terms applies to “b”: “left lateral” or “right lateral”?
v. Explain the difference between True Dip Dip and Apparent Dip

4.

i. Mention seven aspects of discontinuities that are significant with respect to stability of Rock Masses in engineering terms.
ii. Briefly explain each one of the aspects in (i) above with respect to Rock Mass Strength and civil engineering processes.

5.

i. Mention Four physical characteristics/properties to be considered for a good aggregate for engineering use.
ii. Briefly state why each one of the four characteristics in (i) is important?

6.

Site Investigations are carried out in stages, with each stage building up enough information to allow execution of the next:

i. What is a Site Investigation?
ii. Mention two objectives of a site investigation
iii. Mention the various stages involved in Site Investigation.