THE PAPUA NEW GUINES UNIVERSITY OF TECHNOLOGY

DEPARTMENT OF MINING ENGINEERING

2022 FIRST SEMESTER EXAMINATION

Third Year Mining Engineering

MN314 – ROCK FRAGMENTATION

DATE: **FRIDAY 10th 2022**

TIME: **8:50 A.M.**

TIME ALLOWED: **3 HOURS**

INFORMATION FOR CANDIDATE:

1. You have ten minutes to read this question paper. You **SHOULD NOT** begin writing during this period.

2. There are 6 **Questions** in this Paper. **You are required to answer all questions**

3. Marks for each question is as indicated. **TOTAL** questions carry a maximum of 100.

4. **ALL** answers must be written on the answer booklet provided. No other written materials will be accepted.

5. Write your **NAME** and **STUDENT NUMBER** clearly on the **ANSWER BOOK. DO THIS NOW.**

Question 1. *(10 marks)*

Define and discuss Rock Fragmentation and Excavation and its significance in the following industry;

1. Mining Industry
2. Construction Industry
3. Petroleum Industry

Question 2. *(10 marks)*

Discuss the importance of drilling and blasting in mining operations

Question 3 *(20 marks)*

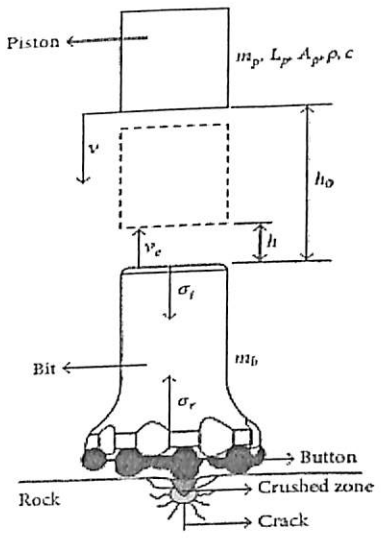
In drilling and blasting there are main key parameters classified as the controllable and uncontrollable parameters in drilling of blast holes for blasting. List the key controllable and uncontrollable parameters and discuss their importance.

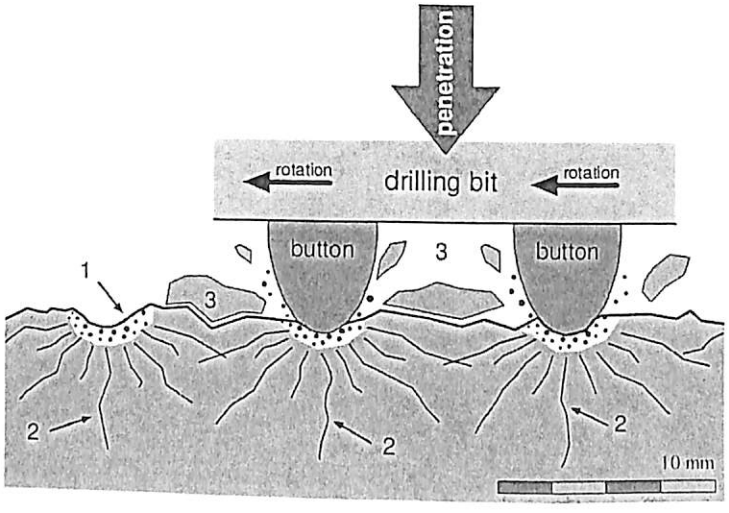
Question 4 *(10 marks)*

The systems of rock drilling that have been developed and classified according to their order of present day applicability. There are different types of drilling methods or drilling system to drill rocks. List five (5) of them and give one 2 or 3 examples of each.

Question 5 *(10 marks)*

With the help of the attached diagram below, describe the process of rock fragmentation and penetration. How the mechanical energy is transmitted through to achieve penetration by the bit. Use diagrams, equation etc... to aid your explanation.





Question 6 *(40 marks)*

In describing the theory of Rock Penetration, science and mathematical models are used to deriving the concept of penetration. These concepts are given below;

1.0 Longitudinal elastic waves in a rod .... ***10 marks***

2.0 Velocity of particles in the stressed zone .... ***10 marks***

3.0 Compressive stress at impact contact ... ***10 marks***

4.0 Bit motion equation and solution ... ***10 marks***

You are required to explain in simple terms with equations and their derivatives and diagrams to clearly explain each concepts (given above) of how the energy is transmitted to through the drill rod to the bit to achieve rock penetration.