



FACULTY OF ENGINEERING AND THE ENVIRONMENT

DEPARTMENT OF MINING ENGINEERING

UNDERGROUND MINING

EMI 5201

Final Examination Paper

July 2022

This examination paper consists of 3 pages

Time Allowed: 3 hours

Total Marks: 100

Examiner's Name: Eng. T. Nyamagudza

INSTRUCTIONS

1. This paper contains **ONE** section with **FIVE** questions.
2. Answer **any FOUR** questions.
3. Each question **carries 25 marks**.
4. Where a question contains subdivisions, the mark value of each subdivision is shown in brackets.
5. Illustrate your answer, where appropriate, with large clearly labelled diagrams.
6. Start each question on a new page.

Additional Requirements

Calculator

MARK ALLOCATION

Question 1 to 5	25Marks
Part Questions	As shown in each part question
Total Attainable	100

Question One.

- (a) State the reasons for going underground. [2]
- (b) What are the ingredients of gun powder? [3]
- (c) Discuss the types of underground mine development [5]
- (d) Describe how auger drilling is utilized for exploration of mineral resources. [5]
- (e) Underground drilling jumbos are widely being used in the mining industry for specific task and for specific mining systems. Outline the general selection criteria for a suitable type of a drill jumbo.

[10]

Question Two.

- (a) Explain sympathetic detonation and gap sensitivity in in blasting operations. [6]
- (b) Marking/lashing in shafts sinking is either manual or mechanised. Discuss, with the aid of clearly labelled diagrams some of the commonly used equipment in mechanised marking in any shaft operations. [9]
- (c) Describe the development of the longwall mining before production starts, with the aid of sketches. [12]

Question Three

- (a) Recall the empirical formula to calculate the number holes required when sinking a shaft with a diameter 4m. [6]
- (b) Describe, with the aid of neatly drawn sketches, the benching system of shaft sinking. [7]
- (c) An underground development round measuring 2 m x 3 m, has the following blasting parameters;
- 38mm diameter drill holes
 - 2.4m depth.
 - 38 charged drill holes and one reamed breather hole.
 - 1/3 stemming length.

Determine the powder factor and draw the drilling pattern while illustrating the initiation / detonation sequence.

[12]

Question Four

- (a) Explain the basic mining and mining development rules. [5]
- (b) State the factors that are considered when determining lining during shaft sinking. [5]

- (c) Discuss the following special methods for shaft sinking;
- i. Grouting method. [4]
 - ii. Freeing method. [4]
- (d) The LHD (Scooptram) is widely used in most mechanised underground operations. State the merits and de-merits of using this type of loading and hauling equipment. [7]

Question Five

- (a) Briefly discuss the pre-production phases in any mining project. [5]
- (b) Explain the following terms related to ore extraction;
- i. Up-dip sequencing and Down-dip sequencing [2]
 - ii. Advance system of attack [2]
 - iii. Retreat system of attack [2]
- (c) Discuss the ore extraction technique in sub-level open stoping mining method. [7]

END OF EXAMINATION