FACULTY OF ENGINEERING AND THE ENVIROMENT

DEPARTMENT OF MINING ENGINEERING

SMALL SCALE / ARTISANAL MINING

EMN 2209

SUPPLEMENTARY EXAMINATION PAPER

SEPTEMBER 2025

This examination paper consists of 4 pages

Time Allowed : 3 hours

Total Marks : 100

Examiner's Name : Miss B. Ncube

INSTRUCTIONS

1. This paper contains One section with 5 questions.
2. Answer Question One (25 marks) and any other Three Questions (25 marks each).
3. Where a question contains subdivisions, the mark value of each subdivision is shown in brackets.
4. Start each question on a new page.

NB; DO NOT OVERTURN THE QUESTION PAPER OR COMMENCE WRITING UNTIL INSTRUCTED TO DO SO.

Additional requirements

Non-programmable calculator.

MARK ALLOCATION

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

ANSWER QUESTION ONE and ANY OTHER THREE QUESTIONS

QUESTION ONE

a) Provide a detailed comparison of small-scale, medium-scale, and large-scale mining operations, emphasizing their differences.
[15 marks]

Table 1.0 : Gold production in Zimbabwe

Feature	**Small-Scale Mining**	**Medium-Scale Mining**	**Large-Scale Mining**
Typical Ore Production volume in tonnes day			
Equipment and Technology Used			
Initial Capital investment			
Revenue contribution to national gold production			
Environmental impacts			

b) Small-scale mining contributes far more to Zimbabwe's national gold production than large-scale mining operations. Discuss the causes for small-scale mining's dominance, as well as the steps that the government, the Ministry of Mines, and mining engineers may do to promote and strengthen small-scale mining's economic contributions.

[10 marks]

QUESTION TWO

As a mining engineer working on a client's project in Zimbabwe's Filabusi Archean granite-greenstone area, you are responsible for creating a detailed funding proposal for a small-scale gold production operation. The proposal will be given to a possible investor who is interested in the tribute mining concept.
Create a concise yet detailed funding project proposal to be given to a possible investor.In your proposal, define the major components of the project, including potential output outcomes and how the money would be employed. [25 marks]

QUESTION 3

a) Explain the term "amalgamation". [4 marks]

b) Describe methods used in artisanal mining operations to extract gold with mercury. [8 marks]

c) Discuss why mercury is preferred to capture gold by artisanal miners in Zimbabwe. [3 marks]

d) Discuss the environmental and health impacts of using mercury for gold processing in Zimbabwe. Give solutions that can be implemented to reduce use of mercury. [10 marks]

QUESTION 4

a) Why is formalization of Artisanal Small-scale Mining (ASM) and trading important? [5 marks]

b) Considering the legal framework governing small to medium scale miners in Zimbabwe, clearly outline fundamental gaps (lacuna) and/or challenges in the current Mines and Minerals Act Chapter 21:05 administered by the Ministry of Mines and Mining Development (MMMD) [8 marks]

c) As a mining engineer, what amendments would you make to the current Mines and Minerals Act Chapter 21:05 in order to create a win-win situation for the ASM miners and Government of Zimbabwe. [8 marks]

d) Discuss four ways in which Artificial Intelligence (AI) can be applied to enhance the efficiency and safety of artisanal and small-scale mining operations in Zimbabwe."

[4 marks]

QUESTION 5

(a) For each of the following artisanal and small scale mining groups, suggest two (2) sustainable mining practices that can be adopted so as to ensure continued sector contribution to national fiscus.

(i) Alluvial gold mining [4 marks]

(ii) Gold reef mining [4 marks]

(iii) Chrome tribute mining [4 marks]

(b) In light of the recent boom in lithium mining in Zimbabwe, particularly within the artisanal mining sector, evaluate the technical challenges and practical solutions associated with extracting lithium from hard rock deposits artisanal scale.

[13 Marks]

-END OF EXAMINATION-