



**FACULTY OF ENGINEERING AND ENVIRONMENT  
DEPARTMENT OF MINING ENGINEERING  
SAFETY, HEALTH AND ENVIRONMENT IN MINING  
EMI 3203  
Final Examination Paper  
July 2022**

**Time Allowed: 3 hours**

**Total Marks: 100**

**Examiner's Name: Miss N.R Gwati**

**INSTRUCTIONS**

1. This paper contains **ONE** section with **SIX** questions
2. Answer **QUESTION 1** and **any other THREE** questions
3. Each question **carries 25 marks**
4. Where a question contains subdivision, the mark value of each subdivision is shown in brackets
5. Start each question on a new page

## Question 1

MINERS SKIP PLUNGES, SEVEN FEARED DEAD (Extract from newspaper article)

SEVEN miners from Bucks Mine in Colleen Bawn are feared dead after hoisting ropes to a skip bringing them up the shaft from underground snapped, plunging them back on a free-fall of about 200 metres. Sources said the skip dragged the miners to the bottom of the shaft and first respondents to the scene saw splatters of blood on the walls of the shaft going down.

The miners who had just finished a shift had been trapped underground from around 5PM on Saturday. An official from the Ministry of Mines who preferred anonymity said the seven men were being pulled out a 200-metre-deep shaft in a cage when a rope snapped and the cage plunged into the shaft. The official said a rescue team was in the process of draining water from the shaft to get to trapped miners. "A team from the office is on the ground as well as a rescue team from Vumbachikwe Mine. For now, the team is trying to drain water out of the shaft. We fear that there might also be mud which will mean that we will have to scoop out the mud as well. "This incident can be linked to negligence because first of all seven men were not supposed to be in that cage at once because it has a low carrying capacity. The rope was also weak to carry the cage," he said.

"The guys were riding on a 1-ton size cocopan (ingorovane), up a vertical shaft slung on a wire rope which snapped towards the surface and they were plunged with the cocopan towards the shaft bottom, shaft has water and mud unknown depth at the bottom." Curious villagers were gathered around the mine as they waited for news on the miners.

One of the villagers, Mr Thando Sibanda said they heard of the accident at the gold mine and had been anxiously waiting for updates.

"Information has been coming in dribs and drabs so we don't really know what's happening. It's very unfortunate that this befell these miners.

We just heard that the ropes that were bringing up the shaft broke and they fell back into the mine. We're just sitting here waiting for more information," said Mr Sibanda.

The owners of the mine had cordoned the area with tight security put in place controlling who gets in or out of the mine. Police were attending to the scene. Last night, Matabeleland South provincial police spokesperson Inspector Loveness Mangena said police had been called to the scene and investigations were underway. "Police are still attending to the scene.

- a. Clearly outline the probable causes of the accident and how you have prevented the accident from occurring as a safety engineer at the mine. [10]
- b. Discuss the social impacts resulting from this accident. [5]
- c. Surface mines are less risky compared to Underground mines when it comes to safety issues. Discuss this statement with relevant supporting information. [10]

## Question 2

- a) You are the Mining Manager at a small open cast coal mine. There have been a number of incident reports in relation to mobile equipment movements around the mine. A number of these have had high potential for serious injury or death.
  - i) Based on this information what process would you adopt to identify the main areas of risk? [5]
  - ii) With the main risks identified, what controls would you adapt to prevent a reoccurrence? [5]

- b) What are the 3 principal hazard that old workings potentially pose to workers and what are the controls could you put in place to manage these 3 principal hazards [5]
- c) State five sources of heat in underground mining operations. [5]
- d) What is the role of legislation in mine environment and occupational health and safety.[5]

#### Question 3

- a) "Most accidents do not just occur they are caused" discuss this statement. [7]
- b) Write short notes on the occurrence, physical and chemical properties, control and physiological effects of carbon monoxide. [7]
- c) **Briefly** discuss the elements of the ISO 45001:2018 clearly showing its importance to the mining industry.[6]
- d) Give five safety precautions that you take when using a named mining machinery at a mine. [5]

#### Question 4

- a) How can the Quebec 5 point system be used to minimize accidents in the mines [8]
- b) Cumulative impacts have caused more damage in the environment with the relevant authorities allowing them to go unattended. Briefly discuss two examples of cumulative impacts related to any mining project. [10]
- c) Describe the four main methods of controlling the production, concentration and hazards of airborne dust.[7]

#### Questions 5

- a) With the aid of specific examples briefly explain how you would you enhance the positive impacts of mining. [10]
- b) Critically discuss the negative Environmental impacts associated with artisanal small-scale mining in Zimbabwe. (10)
- c) What are the main ways of avoiding ghost mining towns in Zimbabwe? [2]
- d) Off-site impacts from mining projects can be a source of serious conflict. With a specific example from Zimbabwe, illustrate the statement is true. [3]

#### Question 6

- a) Briefly discuss three reasons why an Environmental Impact Assessment (EIA) is an important tool in any mining project.[10]
- b) Briefly discuss the importance of an EMP in a mining project? [5]
- c) State the responsibilities of employers in occupational health and safety management systems. [5]
- d) How does site selection minimize negative impacts in waste disposal? [5]