**FACULTY OF ENGINEERING AND ENVIRONMENT**

**DEPARTMENT OF MINING ENGINEERING**

**COMPUTER APPLICATIONS IN MINING**

**EMN 2202**

**SUPPLEMENTARY EXAMINATION PAPER**

**SEPTEMBER 2025**

This examination paper consists of 4 pages

**Time Allowed: 3 hours**

**Total Marks: 100**

**Examiner's Name: MS C MACHADU**

**INSTRUCTIONS**

1. Section A is **compulsory**
2. **Answer any 3 questions in section B**
3. **Answer 1 in section C**

**Additional Requirements**

None

**MARK ALLOCATION**

| | |
|---|---|
| **Section A** | **25 marks** |
| **Section B** | **60 marks** |
| **Section C** | **15 marks** |
| **Part Questions** | **As shown in each part question** |
| **Total Attainable** | **100 marks** |

## Section A: Short Answer Questions (25 Marks)

**QUESTION 1**

a) Define Geostatistics and explain its importance in mineral resource estimation. [4]

b) What are the key functions of GEOVIA Surpac in mine planning and design? [4]

c) Explain the purpose of MineSched in short-term and long-term mine scheduling. [4]

d) Describe how machine learning can be applied in mining equipment maintenance prediction. [4]

e) What are the advantages of using computer modelling in mining engineering? [4]

f) Explain how Artificial Intelligence (AI) can be integrated with Surpac and MineSched for automated mine planning. [5]

## Section B: Applied and Analytical Questions (60 Marks)

(Each question carries **20 marks**. Answer any **three**)

**QUESTION 2**

**Surpac Application in Ore Body Modeling**

a) Describe the workflow for creating a block model in Surpac. [10]

b) How does Surpac assist in grade control and mine planning? [10]

**QUESTION 3**

**MineSched for Production Scheduling**

a) Explain how MineSched is used for both underground and open-pit mines. [10]

b) Discuss the key input parameters required for generating a production schedule in MineSched. [10]

**QUESTION 4**

**Machine Learning in Mining**

a) What are the three main types of machine learning? Provide examples of each in mining applications. [10]
b) How can machine learning improve drill and blast optimization? [10]

**QUESTION 5**

**Computer-Aided Mine Planning**

a) Discuss the role of CAD-based software in mine planning. [10]
b) Compare Surpac with any other mining software in terms of data visualization and scheduling. [10]

## Section C: Case Study & Practical Questions (15 Marks)

(Each question carries **15 marks**. Answer any **one**)

**QUESTION 6**

**Mine Optimization Using Software**

A gold mine is experiencing delays due to poor haulage planning. As a mining engineer, describe how Surpac and MineSched can be used to optimize the haulage routes and reduce idle time. [15]

**QUESTION 7**

**Machine Learning Implementation in Mining**

Design a machine learning model that predicts ore grade based on historical exploration data. Describe the key features, data inputs, and machine learning algorithms that would be used. [15]