**FACULTY OF ENGINEERING AND ENVIRONMENT**

**DEPARTMENT OF MINING ENGINEERING**

**COMPUTER APPLICATIONS IN MINING**

**EMN 2202**

**Final Examination Paper**

**APRIL2025**

This examination paper consists of 4 pages

**Time Allowed: 3 hours**

**Total Marks: 100**

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

**INSTRUCTIONS**

1. Answer all questions in **Section A** and **Section B**
2. Neat diagrams and examples will carry extra marks.

**Additional Requirements**

None

**MARK ALLOCATION**

| | |
|---|---|
| **Section A** | **20 marks** |
| **Section B** | **80 marks** |
| **Part Questions** | **As shown in each part question** |
| **Total Attainable** | **100 marks** |

## Section A: Short Answer Questions (20 Marks)

**QUESTION 1**

a) Define computer-aided mine design (CAMD) and explain its role in modern mining. [4]

b) How does MineSched improve operational efficiency in underground mines? [4]

c) What is block modelling in Surpac, and why is it important for resource estimation? [4]

d) Explain the significance of machine learning in predictive maintenance for mining equipment. [4]

e) How can GIS (Geographic Information System) be used in mine site selection and planning? [4]

## Section B: Applied and Analytical Questions (80 Marks)

(Each question carries **20 marks**. Answer **ALL.)**

**QUESTION 2**

**Application of Surpac and Minesched Mine Planning**

a) Define geostatistics and explain why it is employed by outlining the various approaches used. Briefly why each approach is used. [10]

b) How does MineSched assist in equipment allocation and resource forecasting? [10]

**QUESTION 3**

**Role of Artificial Intelligence (AI) in Mining**

a) Discuss **three AI applications** in mining. [10]

b) How does **AI-driven autonomous haulage** improve safety and efficiency? [10]

**QUESTION 4**

**Geostatistical Analysis in Mining**

a) Explain the process of **variography** and how it is used in ore body modelling. [10]

b) What are the benefits of using **kriging** for resource estimation? [10]

**QUESTION 5**

**Geological modelling using surpac.**

Clearly outline the use of Surpac for Geological Modelling and Resource Estimation. Your answer should include the following points:

i. How Surpac aids in visualizing geological data.
ii. Techniques for resource estimation using Surpac.
iii. Benefits of using Surpac in mine planning. [20]