GWANDA STATE UNIVERSITY

FACULTY OF ENGINEERING AND THE ENVIRONMENT

DEPARTMENT OF MINING ENGINEERING

COMPUTER APPLICATIONS IN MINING (EMN 2202)

JUNE 2024

Time Allowed: **3 hours**

Examiner's Name: **Mr. P Sithole**

INSTRUCTIONS

1. The question paper contains **TWO** questions in Section A and **THREE** questions in **Section B**
2. Answer **ALL** questions in **Section A** and any **TWO** in **Section B**
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. Be as INFORMATIVE as you can be
7. Start each question on a new page.
8. **NO** additional material is required.

This examination paper consists of 3 printed pages

SECTION A: ANSWER ALL QUESTIONS

QUESTION ONE

a) New technologies such as Data Science and Machine Learning have revolutionized how data is analyzed and how decisions are made. Briefly describe an area of your choice within mining operations where these technologies can be applied. Highlight two advantages that the use of these technologies would bring to the chosen area. **[10 Marks]**

b) Briefly describe, with an example, the use of specialized computer applications in each of the following fields:

i. Mine Surveying **[5 Marks]**

ii. Mine design and planning **[5 Marks]**

iii. Rock mechanics **[5 Marks]**

QUESTION TWO

a) A mining company intends to develop a mining information system in-house.

i. Briefly discuss the merits of outsourcing the development of the system over developing the system in-house. **[4 Marks]**

ii. Outline the advantages and disadvantages of using proprietary software over open-source software in the development of the system. **[8 Marks]**

iii. Briefly describe four (4) software evaluation factors that should be taken into consideration during the implemetation phase of system development. **[8 Marks]**

b) What factors could lead to the failure of a system development process? **[5 Marks]**

SECTION B: ANSWER ANY TWO QUESTIONS

QUESTION THREE

a) A mining company intends to establish a network of air quality sensors in its underground mine, what network topology (Logical and Physical) would you recommend for the sensor network and why? Use a diagram to illustrate the proposed topology. **[10 Marks]**

b) Briefly describe two (2) areas within mining operations where remote operation of machinery could be implemented. State two (2) advantages that remote operation would bring to each area. **[10 Marks]**

c) What are the potential risks associated with the use of ICTs to remotely control machinery in the mining environment? **[5 Marks]**

QUESTION FOUR

a) Briefly describe any five (5) advantages of using information processing machines, for each advantage identified, give an example of how it would benefit a mining company. **[10 Marks]**

b) Briefly describe any five (5) threats that modern ICT systems are faced with and for each threat identified outline a mitigatory measure that can be implemented to lower the risk of that threat. **[15 Marks]**

QUESTION FIVE

a) Briefly describe two (2) benefits of maintaining information in a database as opposed to using spreadsheets. **[5 Marks]**

b) A mining company wants to develop a database to capture information about its employees (*name, sex, Date of birth, employee number, department*), employee dependants (*name, date of birth, ID number, parent*), departments (*unique name, head of department*)

i. Design a database to capture all the data, show your design in the form of a database schema and an Entity Relationship diagram. **[15 Marks]**

ii. Design a query that returns the full names of dependants and the full parent name for all dependants below the age of 18 and whose parent work in the "planning" department. **[5 Marks]**

END OF EXAMINATION