



**FACULTY OF ENGINEERING AND THE ENVIRONMENT
DEPARTMENT OF MINING ENGINEERING**

**EMN 3108 – MINE MACHINERY, MATERIALS HANDLING AND SERVICES
Examination Paper September 2024**

Time Allowed: **3 hours**
Total Marks: **100**

Examiner's Name: **MANESWA G**

Additional Requirements

- Calculator

INSTRUCTIONS:

1. This paper contains **TWO** sections
2. Answer all questions in Section **A** and any **3** questions in Section **B**.
3. Show all your working for full credit.
4. Start each question on a new page.

This examination paper consists of **5** pages

Section A [40 marks]
Answer all questions

Question One

a) Multiple Choice [20 marks]

Choose the most appropriate answer for each of the following questions.

- i. Which type of mining equipment is primarily used for the initial breaking of rock in surface mining operations?
- A Shovels
 - B Draglines
 - C Rotary drills
 - D Haul trucks
- ii. Which of the following is a key consideration in the selection of material handling systems for a mining operation?
- A Maximizing the transportation distance.
 - B Minimizing the number of transfer points.
 - C Reducing the overall energy consumption.
 - D All of the above.
- iii. The primary function of a hoist in an underground mining operation is to:
- A Excavate and load the mined materials.
 - B Transport personnel and materials vertically.
 - C Crush and process the extracted ore.
 - D Ventilate the underground workings.
- iv. Which of the following is a common maintenance strategy for mining equipment?
- A Reactive maintenance
 - B Preventive maintenance
 - C Condition-based maintenance
 - D All of the above

- v. Which of the following is a primary function of a mining excavator?
- A Material crushing
 - B Ore beneficiation
 - C Overburden removal
 - D Drilling and blasting
- vi. The main purpose of a mining conveyor system is to:
- A Increase material storage capacity
 - B Enhance material handling efficiency
 - C Improve worker safety
 - D Reduce energy consumption
- vii. Which of the following is a key consideration in the design of mining ventilation systems?
- A Dust control
 - B Noise reduction
 - C Automation
 - D Corrosion prevention
- viii. Which of the following is the primary function of a dragline in surface mining operations?
- A Excavation and loading of overburden
 - B Crushing of mined material
 - C Transporting of ore to the processing plant
 - D Stockpiling of processed material
- ix. The key design parameter that determines the capacity of a wheel loader is the:
- A Bucket size
 - B Boom length
 - C Swing radius
 - D Breakout force

x. In a conveyor belt system, the role of the idlers is to:

A Provide power to the belt

B Maintain the belt tension

C Support the weight of the material on the belt

D Control the belt speed

b) i. A mining operation extracts 50,000 tonnes of ore per day. The ore needs to be transported from the extraction site to the processing plant, located 2 km away. The mining company is considering using a conveyor belt system to move the ore. If the conveyor belt is designed to operate at a speed of 2 m/s and has a capacity of 1,000 tonnes per hour, calculate the number of conveyor belts required to meet the daily production target. **[10 marks]**

ii. A dragline excavator at a surface mining site has a bucket capacity of 50 m³ and a digging depth of 25 m. The excavator is required to load 20,000 m³ of overburden per day. Assuming the excavator operates for 18 hours per day, calculate the average number of bucket cycles per hour required to meet the daily production target. **[10 marks]**

Section B [60 marks]
Answer any 3 Questions

Question Two

Discuss the role of data-driven technologies and automation in the optimization of mining machinery and material handling systems. Explain how these technologies can improve the overall efficiency, productivity, and safety of mining operations. Provide examples of specific applications and their benefits. **[20 marks]**

Question Three

A mining operation is experiencing frequent unplanned downtime due to mechanical failures in its haul trucks. Propose a comprehensive maintenance strategy to improve the reliability and availability of the haul truck fleet. Include considerations for preventive maintenance, condition monitoring, and spare parts management. **[20 marks]**

Question Four

Describe the purpose and key components of a mine de-watering system. Explain how the design of this system can impact overall mining operations and environmental compliance. **[20 marks]**

Question Five

Evaluate the environmental impact of using large-scale mine machinery and propose ways to minimize this impact. **[20 marks]**

Bon Courage!!!