NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY

FACULTY OF ENGINEERING AND THE BUILT ENVIRONMENT

DEPARTMENT OF CIVIL, MINING AND PROCESS ENGINEERING

QUALIFICATION : BACHELOR OF ENGINEERING IN MINING ENGINEERING	
QUALIFICATION CODE: 08BMEG	LEVEL: 7
COURSE CODE: SUM710S	COURSE NAME: SURFACE MINING 315
SESSION: JUNE 2023	PAPER: THEORY
DURATION: 2 HOURS	MARKS: 100

SECOND OPPORTUNITY EXAMINATION	
EXAMINER(S)	Privilege Rangarirai Shava, Pr.Eng.
MODERATOR:	Prof. Mallikarjun Rao Pillalamarry

INSTRUCTIONS

1. Answer all questions.
2. Read all the questions carefully before answering.
3. Marks for each question are indicated at the end of each question.
4. Please ensure that your writing is legible, neat and presentable.

PERMISSIBLE MATERIALS

1. Examination paper.
2. Scientific Calculator.
3. Queue Table.

THIS QUESTION PAPER CONSISTS OF 3 PAGES (Including this front page)

Question 1

a) You have been tasked to select equipment for a new uranium open-pit mining operation. The General Manager assigns you to give an overview of what considerations you would make in selecting equipment for the entire operation. Highlight and explain the considerations you would present to the company General Manager. [5]

b) Explain in detail how the equipment selection process fits into the surface mine optimization process, clearly outlining its role and significance within the entire mine optimization and evaluation framework. [5]

c) Evaluate the concept of in-pit crushing from a productivity and economic viewpoint. [5]

d) Evaluate the factors that affect slope stability in an open-pit mine, clearly outlining their importance in maintaining slope stability. [6]

e) State the factors one would consider in determining the following:

   I. Bench height [2]

   II. Haul road location [2]

Question 2

a) With reference to open-pit mining, explain how the following factors would govern bench height:

   i. Degree of selectivity required in separating ore and waste. [5]

   ii. Production rate. [5]

   iii. Physical characteristics of the deposit. [5]

b) It is often necessary to consider the conversion of a surface mining operation to underground mining operation. Evaluate the factors that you would consider in converting a surface mining operation to an underground mining operation. [10]

Question 3

You are presented with the following surface mine stripping operation:

Material parameters:

- Volume to be excavated, hauled and compacted – 45 000m^3
- Compaction factor - 0.93
- Bank density - 2 150 kg/m^3
- Loose density - 1 500 kg/m^3

Hydraulic excavator (1 unit available):

- Bucket size – 8.2 m^3
- Bucket fill factor – 0.96
- First bucket – 0.1 mins
- Additional bucket – 0.7 mins
- Truck transfer time – 0.5 mins
- Maximum loader activity/hr – 52 mins

- Charge per hour – $185/hr

Hauling units (4 units available):

- Mass, empty – 40.19 tons
- Maximum GVM (Gross vehicle weight) – 99.3 tons
- Haul route segment lengths and speeds are tabled overleaf:

Segment	Distance (m)	Speed (km/hr)
1	250	53
2	600	22
3	450	33
4	150	33

- Consider a maximum allowable speed of 45km/hr on the return route and an additional 2.5 min dumping time.
- Truck charge – $125/hr

Evaluate the following:

a) The load & haul cost per ton. [10]

b) Duration of the project in days, by suggesting suitable shift duration. [5]

c) Number of trucks per loader to yield minimum cost per tonne. [5]

d) Comment on your answer in (c) from an efficiency and cost perspective. [5]

Make use of the queue tables provided for this question.

Question 4

a) An open-pit mine is experiencing persistent "fall-of-ground" at one section of the pit. In your opinion, what could be the key potential causes (two) of this situation? [4]

b) Explain how the situation in a) can be remedied, and any potential impacts of the proposed remedies. [6]

c) Haul roads are an important part of the design of an open-pit mine. Identify any three factors that need consideration in the location of a haul road. [3]

d) Distinguish the possible haul road configuration types. You may use a diagram to aid your explanation. [6]

e) What are the comparative advantages and disadvantages of each of the haul road configurations identified above? [6]

---End of Examination Paper---