FACULTY OF ENGINEERING AND THE ENVIRONMENT

DEPARTMENT OF MINING ENGINEERING

SURFACE MINING

EMI 5102

Final Examination Paper

JUNE 2023

This examination paper consists of 3 pages

Time Allowed: **3 hours**

Total Marks: **100**

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INSTRUCTIONS

1. This paper contains **ONE** section with **FIVE** questions.
2. Answer **any THREE questions**.
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. Start each question on a new page.

Additional Requirements

Calculator

MARK ALLOCATION

Question 1 to 5	**25Marks**
Part Questions	**As shown in each part question**
Total Attainable	**100**

Question One

(a) Indicate the conditions (i.e. with respect to ore body shape, ore body dip, and waste handling methodology **only**) which suit the application of each of the following surface mining methods:

i. Terrace mining; **[3]**

ii. Strip mining; and **[3]**

iii. Open Pit mining. **[3]**

(b) With the aid of suitable sketches, briefly describe the strip mining method. **[16]**

Question Two

A particular open-cast loading and hauling system is a single-queue single-server with the trucking time taking 15 to 18 minutes while the loading time is about 4 minutes.

a) By making use of the match factor, calculate the number of trucks required in this material handling system. **[5]**

a) Given that the expected truck availability for the material handling system mentioned in (a) is 80%, compute the fleet size required for such an operation. **[5]**

b) Compute the expected waiting time if the trucks within the loading and hauling system are increased by 1 truck.

[3]

c) Describe the following:

i. Two (2) causes of a low match factor, **[4]**

ii. Two (2) effects of a low match factor, and **[4]**

iii. Two (2) solutions that increase the match factor to the required level.

[4]

Question Three

(a) Illustrate each of the following open pit mine structures/features on a single clearly labelled diagram. Berm width, berm slope angle, pit floor, overall pit slope angle, crest of bench, toe of bench, bench slope angle, road and ramp width, bench face bench.

[10]

(b) The Dragline is the most widely used machine in surface strip coal mining. Discuss in detail the advantages and disadvantages of draglines in strip coal mining application. **[15]**

Question Four

(a) Briefly describe the operating principle of percussion drilling using the four basic functions involved.

[8]

(b) During drilling, the feed force is needed to keep the drill bit in contact with the rock. Outline (2) two negative consequences for each of the following operating conditions

i. Excessively low feed **[2]**

ii. Excessively high feed **[2]**

(c) What is the purpose of the following during drilling?

i. Water

ii. Lubricant

iii. Compressed air. **[6]**

(d) Differentiate Out-Of the Hole and Down-The-Hole drilling. **[6]**

Question Five

a) i. Briefly describe three (3) challenges associated with the transition from an open-pit mine to a suitable underground mining method so as to extract a deep-seated ore body. **[9]**

ii. Suggest two (2) approaches that can be used to determine the transition point mentioned in (a) (i). **[4]**

b) Pertaining to open cast extraction of old underground workings, explain the suitability of either the bord-and-pillar collapse or the bord collapse techniques in achieving the following:

i. Low dilution **[6]**

ii. Subsidence free benches **[6]**

END OF EXAMINATION