UNIVERSITY OF JOHANNESBURG

PROGRAM	:	BACHELOR OF ENGINEERING TECHNOLOGY **(**MINING ENGINEERING**)**
SUBJECT	:	**MINING 3A**
CODE	:	**MINMNA3**
DATE	:	17 JULY 2019 SUPPLEMENTARY EXAMINATION
DURATION	:	3 HOURS (15H00 - 18H00)
TOTAL MARKS	:	100

EXAMINERS	:	T MMOLA
MODERATOR	:	S NHLEKO
NUMBER OF PAGES	:	3 PAGES incl. COVER PAGE

REQUIREMENTS

1. ONE SCIENTIFIC CALCULATOR
2. ONE ANSWER SCRIPT

INSTRUCTIONS

1. ANSWER ALL QUESTIONS
2. UNDERLINE AFTER EACH QUESTION
3. SUBMIT YOUR QUESTION PAPER WITH THE ANSWER SCRIPT

QUESTION 1

1.1 Discuss the importance of the cycles of unit operations of mining and how they contribute to the overall efficiency of the system in which they are utilised. (20)

[20]

QUESTION 2

2.1 Name the operating components of a drilling system and state the purpose of each component. (8)

2.2 Discuss the rotation drilling and percussive drilling methods. (10)

2.3 What affects drilling cycle time? (4)

2.4 Propose problems that may arise from inaccurate drilling with respect to the following: (10)

(a) Drill hole length
(b) Drill hole direction
(c) Drill hole angle
(d) Drill hole diameter

2.5 What are the most important drill performance parameters to be considered in drill selection? (4)

[36]

QUESTION 3

3.1 You are the new mining engineer at a large open pit copper mine. Mining will be in hard but competent rock and in wet conditions. The mine is using a DTH percussion drill rig with 106mm drill bit. Excavation will be done with a hydraulic shovel that has a maximum reach of 12m. The manager requires you to design a blast pattern for the mine. Design the blast pattern for the mine using "rules-of-thumb". (12)

3.2 Provide a plan and section view of the design. (not to scale) (8)

3.3 What type of blast pattern have you designed? (1)

3.4 How would you alter your design to achieve the other two types of blast patterns? (2)

3.5 Assuming bulk emulsion explosives with a density of 1.2g/cc will be used, what is the quantity of explosives, in kilograms, required per hole? (7)

[30]

QUESTION 4

A development heading has a 5.0m x 5.5m profile and a planned advance per blast of 3.0m. The in-situ rock density is 2.7t/m3 and swell factor is 1.4. The mine utilises a homogeneous fleet of LHDs with a bucket capacity of $6m^3$. The mine procedure states that only one LHD may operate in a heading. The LHD takes on average 50 seconds to load, 6 minutes to travel to the tipping point, 20 seconds to dump at the tip and 4 minutes to return to the face. You may assume a LHD bucket fill factor of 92%.

4.1 Determine the total time to clean one development heading considering a 60 seconds delay in each cycle time. (7)

4.2 Determine the hourly production rate per LHD (3)

4.3 The LHD has an average availability of 70%. Explain what is 'availability' and give two factors that influence equipment availability. (4)

[14]

TOTAL **[100]**