



PROGRAM : BEng. Tech (Mining)
BEng. Tech (Mine Surveying)

SUBJECT : Mining Surface 2A

SUBJECT CODE : SMMMNA2

EXAMINATION : SUPPLEMENTARY FINAL SUMMATIVE
EXAMINATION

DATE : JANUARY 2019

DURATION : 180 MINUTES

TOTAL MARKS : 120

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MODERATOR : Mr. Gerald Bosch

NUMBER OF PAGES : 5 PLUS FORMULAE SHEET

INSTRUCTIONS:

1. **PLEASE** answer **ALL** questions
 2. A question means all the sub-questions that appear under the heading of that question. All the sub-questions must be kept together under the heading of a specific question
 3. Number all questions, and associated sub-questions **CLEARLY**
 4. A formulae sheet is herein attached
 5. The use of a calculator is permissible
 6. All the relevant rules of the University of Johannesburg shall apply
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Question 1

- 1.1 In your own words, explain the global environmental concerns pertaining surface mining. What are the typical global solutions you would recommend (to address the concerns)?

[10]

- 1.2 Relative to a comparable underground mine, the capital and operational costs of the surface are generally lower than that of the underground mine. Comment on the reasonableness or unreasonableness of the statement. Typically, which aspects of an operational mine would justify the reasonableness or unreasonableness (correctness or incorrectness) of the statement?

[10]

[20]

Question 2

- 2.1 Describe typical favourable conditions for the following:

2.1.1 Open pit mining

2.1.2 Strip mining

2.1.3 Terrace or Quarry mining

[20]

- 2.2 Explain the following terms with the aid of sketches, as they apply to an open-pit operation.

a. Overall slope angle

[2]

b. Bench height

[2]

c. Bench slope

[2]

- 2.3 With regards to an open-pit operation, explain the relative steepness (i.e. which one is steeper) between the individual bench slope angle on one hand and the overall pit slope angle on the other? Justify your answer

[4]

- 2.4 In an open-pit operation, discuss the concept of stripping ratio and how it generally impacts on the mine short-, medium, and long-term profitability. Does the stripping ratio impact on the life-of-mine plan? Justify your answer

[10]

[40]

Question 3

- 3.1 Using the data given below, calculate the BCM hauled per truck in wet and dry conditions. State all your assumptions

Truck: CAT 789 195t capacity using 36.00R51 tyres, 317t GVM

Route length: 4,6 km (up and down) against a 6% uphill slope for the loaded trucks.

Assume that the rolling resistance is 2% when dry, 4% when wet road.

Rock density: 2t/m³ loaded or 2,5t/m³ in-situ

Loading time: 3,4min for full load

Dump time: 2,4min

[10]

- 3.2 Typical data for a CAT 789 truck is given below. The truck completes 3 trips per hour over a total distance of 10km (loader to dump and back). The current tyre TKPH is 385. Comment on the suitability of this tyre choice under the given conditions.

Truck GVM (t) 283

Truck EVM (t) 129

Mass distribution when fully laden:

Front axle (t) 90,56

Rear dual axle (t) 192,44

[10]

[20]

Question 4

- 4.1 Explain the capability of a typical rotary drill machine

[2]

- 4.2 Using the rule of thumb guidelines, indicate your choice of drill machine for the following:

- 4.2.1 Hard rock ($Q_c > 150 \text{ MPa}$) , diameter approximately 120mm
- 4.2.2 Hard rock ($Q_c > 150 \text{ MPa}$) , diameter approximately 154mm
- 4.2.3 The largest diameter in hard rock mines are 180 – 400 mm
- 4.2.4 Strip mines, and open-pit mines

[8]

- 4.3 For drilling overburden at a strip mine in the Witbank area, 250mm tricone button drill bit was suggested. The overburden material comprises siltstone and sandstone with compressive strengths of 110MPa and 140MPa respectively. The total overburden is 20m which the upper 8m is siltstone

- 4.3.1 Find the maximum pulldown that can be applied on the drill bit
- 4.3.2 Given the rotation tempo of 80rpm which is constant throughout drilling the hole, if the maximum pulldown is applied, how long will it take to drill the hole?
- 4.3.3 If the drilling pattern comprises 60 boreholes and there is a pullout time of 2 minute, a travelling time of 3 minute and a positioning time of 1 minute between the holes, calculate the time it will take to drill the pattern (assume single-pass drilling)

[10]

[20]

Question 5

- 5.1 What are mine haul roads used for? In your own words, explain the objectives of mine haul road design

[10]

- 5.2 Explain rolling resistance. With the aid of a figure or diagram, indicate the point of maximum rolling resistance between the tyre of a laden truck and a contact surface. Comment on the deformation that may occur as attributable to a soft surface contact as opposed to a hard surface contact

[10]

[20]

TOTAL MARKS [120]
