



FACULTY OF ENGINEERING AND THE ENVIRONMENT

DEPARTMENT OF MINING ENGINEERING

TECHNICAL VALUATION

EMI 3102

Final Examination Paper

January 2021

Time Allowed: 3 hours
Total Marks: 100
Examiner's Name: Miss N.R Gwati
Authorised material: Calculator

INSTRUCTIONS

1. This paper contains **ONE** section with **FIVE** questions
2. Answer **QUESTION 1** and **any other THREE** questions
3. Each question **carries 25 marks**
4. Where a question contains subdivision, the mark value of each subdivision is shown in brackets
5. Start each question on a new page

Question 1

- a) Give a scientific critique of Gy Pierre's theory of sampling. **[8 marks]**
- b) Given the following sampling conditions for a gold bearing ore crushed to about 0.93 cm, with $c = 16\,000\,000$ for a gold-silver amalgam, $f = 0.5$, $g = 0.25$ and $l = 0.000035$
 - I. What error is introduced when a sample of given weight, $MS = 10000g$, is taken from a pile of broken ore? Assume that $dN = 1.25$ cm. **[4marks]**
 - II. What degree of crushing or grinding is required in order to achieve an error variance σR^2 of 0.0225, and that the mass of material to be collected is 15 kg? **[4marks]**
- c) You have been appointed mine planner of Filabusi Gold Company how would you control dilution at the mine and what are the effects of dilution if not controlled? **[9 marks]**

Question 2

- a) What are the 3 principles governing the operation and application of the JORC Code. **[3 marks]**
- b) Define a 'competent person' with reference to the SAMREC code **[5 marks]**
- c) As a technical services manager, you are required to come up with reserves from the resources that you have at a mine. Briefly describe the factors that you are going to consider when converting resources to reserves. **[10marks]**
- d) Under what conditions would you consider those reserves as resources again? **[8 marks]**

Question 3

- a) Define stripping ratio and explain stripping ratio as a pay limit. **[5 marks]**
- b) What is the meaning of the intersection point on a grade-tonnage curve? **[5marks]**
- c) What are the limitations of grade-tonnage curves? **[5marks]**
- d) A gold mine produces 1564t of ore of which 632t at a grade of 0.36g/t comes from development rock which is below cut-off grade. The ore grade is 3.47g/t. Calculate the mill feed grade. **[5marks]**
- e) ROM ore from different sections of a platinum mine were heaped separately as heap 1 to 5 and sampling was done and the grades were observed as shown in Table 3. Calculate the weighted mean grade for the platinum deposit with grades and tonnage as shown in Table 1.

Table 1: Tonnage and grade of platinum

Heap	Tons (t)	Grade (g/t)
1	10	12.6
2	28	6.7
3	12	10.2
4	5	20.3
5	15	5.8

[5marks]

Question 4

- Explain the importance of taking samples at every stage of a mining project and explain any measures that will help to control the quality of your assay results. **[12 marks]**
- Give any 5 sources of error which results in contamination either during sampling, transportation or assaying **[5 marks]**
- Determine the propagation of errors when the percentage error for sampling, transportation and assaying are 3%, 7% and 5% respectively **[3 marks]**
- As a technical services manager what factors should you consider when selecting a method of sampling. **[5 marks]**

Question 5

- What is the difference between the Spearman Rank Correlation Coefficient (r_s) and Pearson's correlation coefficient? **[4 marks]**
- The following are the age (in years) and systolic blood pressure of 20 apparently healthy adults.

I.

Age (x)	B.P (y)	Age (x)	B.P (y)
20	120	46	128
43	128	53	136
63	141	60	146
26	126	20	124
53	134	63	143
31	128	43	130
58	136	26	124
46	132	19	121
58	140	31	126
70	144	23	123

- Find the correlation between age and blood pressure using simple and Spearman's correlation coefficients, and comment. **[13 marks]**
- II. Find the regression equation? **[5 marks]**
- III. What is the predicted blood pressure for a man aging 25 years? **[3 marks]**