FACULTY OF ENGINEERING AND THE ENVIRONMENT

DEPARTMENT OF MINING ENGINEERING

ORE DRESSING & EXTRACTION

EMI 2104

Final Examination Paper

January 2020

This examination paper consists of 3 pages

Time Allowed: 3 hours

Total Marks: 100

Examiner's Name: Mr A.A Mukichi

INSTRUCTIONS

1. This question paper consists of 6 questions, **YOU MUST ANSWER QUESTION ONE (1)** and **ANY OTHER THREE (3) QUESTIONS.**
2. Each question carries 25 marks.
3. Answer each question on a new page and write as eligible as possible.

Additional Requirements:
Non-Programmable Calculator

MARK ALLOCATION

Question 1 to 6	**25Marks**
Part Questions	**As shown in each part question**
Total Attainable	**100**

Question 1 [25 marks]

a) What measures can a mining engineer take to ensure high recovery in the metallurgical plant?

[10marks]

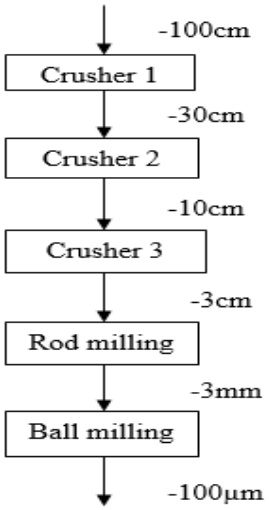

Figure 1: Comminution circuit

b) Given that the throughput for the comminution circuit in Figure 1 was 300 t/h and the work index is 14 kwh/t. Calculate

i. Bond work index for each circuit. **[8marks]**

ii. Total energy required in this whole circuit. **[3marks]**

c) Feed – 0.9%Fe, Concentrate – 30%Fe, Tails – 0.1% Fe. You are required to calculate:

i. The ratio of concentration

ii. Enrichment ratio. **[4marks]**

Question 2 [25 marks]

a) Briefly describe the role of 3 types of cells found in a flotation system. **[6marks]**

b) A plant is being fed with metallic ore assaying 3.3 g/t PGM, producing a concentrate product assaying 160 g/t PGM and tailings assaying 0.4g/t PGM.

i. What is the recovery of PGM? **[5marks]**

ii. If the feedrate is 150tonnes per hour, what is the tonnage of concentrate produced in a 30-day month if the plant operates for 20 hours daily? **[5marks]**

c) Describe with the aid of a clearly labelled flow diagram the processing of platinum using mineral processing method, from crushing to refining. **[9marks]**

Question 3 [25 marks]

a) List any five (5) factors that affect the leaching process. **[5marks]**

b) Feed -28760 tonnes,1.1% Fe, Concentrate -25.9% Fe, Tailings – 0.12% Fe, Weight of concentrate -1090tonnes. 257tonnes of concentrate were in transit at the beginning of the month and 215t of concentrate were in transit at the end of the month.

   i. Calculate the actual recovery. **[6marks]**

   ii. Calculate the theoretical recovery. **[4marks]**

   iii. State 3 areas where the error might have occurred. **[3marks]**

c) As a general manager of a mine, you are required to reduce cost in the metallurgical plant. How would you reduce cost at every stage of the processing plant? **[7marks]**

Question 4 [25 marks]

a) Define an open circuit and closed-circuit system with the aid of a clearly labelled diagrams. Highlight the advantages of closed circuit over open circuit grinding. **[6marks]**

b) Describe with the aid of a clearly labelled flow diagram the processing of gold using hydrometallurgical means, from leaching to refining. **[10marks]**

c) List the main purposes for classification in the minerals industry. **[4marks]**

d) Determine the volume of a thickener into which slurry containing 40 % solids by weight is being pumped at a rate of 100 tonnes per hour, given that the residence time of the slurry is 5sec and the solids density is 2.75 g/cm3 (dry basis). **[5marks]**

Question 5 [25 marks]

a) Briefly describe CIS, CIP and CIL used in hydrometallurgical processing of gold. **[6marks]**

b) State the factors that affect the screening process in Ore Dressing and Extraction. **[5marks]**

c) Describe the role of five types of reagents used in the flotation circuit. **[10marks]**

d) What is the difference between hydrometallurgy and pyro-metallurgy? **[4marks]**

Question 6 [25 marks]

a) Outline the role of mineral dressing in the mining industry. **[5marks]**

b) The choice of method used to process a mineral is dependent on its properties. State five of these properties and for each property describe a method used in full and give examples of processes used in that method. **[20marks]**