GWANDA STATE UNIVERSITY

FACULTY OF ENGINEERING AND ENVIRONMENT

DEPARTMENT OF MINING ENGINEERING

MINERAL BENEFICIATION

EMN 4202

FIRST SEMESTER SECOND SEGMENT EXAMINATION (2024)

This examination consists of 4 pages

Time Allowed: 3 hours

Total Marks: 100

Special Requirements: Graph paper and a scientific calculator

Examiner's Name: Ms K.L Mahamba

INSTRUCTIONS

1. Answer Question A1 in Section A and any other 3 questions in Section B

2. Question A carries 40 marks and each question carries 20 marks in Section B

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SECTION A: ANSWER ALL QUESTIONS IN THIS SECTION (40 MARKS)

QUESTION A1

a. You are given a task to extract a mineral from its ore, explain the basic steps used to extract the mineral from its ore deposit. **[10]**

b. What are the negative impacts of Mineral Processing activities on the environment and the country's economy? **[4]**

c. Explain the 2 fundamental operations in mineral processing. **[8]**

d. Describe the froth floatation process and outline the following:

i. Collector

ii. Depressant

iii. Activator

iv. Frother, giving examples of each**.** **[12]**

e. Explain the following leaching methods:

i. VAT leaching

ii. Dump leaching

iii. Heap leaching. **[6]**

SECTION B: CHOOSE ANY THREE QUESTIONS (60 MARKS)

QUESTION B1

a. Describe how you would process(beneficiate) a sulphide and oxide ore of your choice from ROM ore until it's a finished product. **[10]**

b. Explain the difference between a closed and an open milling circuit. **[10]**

QUESTION B2

a. The geological section of your mining company has discovered a new deposit. It is suggested solution mining is the most probable method of extracting the valuable mineral. As the responsible engineer, you are required to appraise the use of solution mining for this particular deposit. Explain what considerations you would carry out and what would be your basis of recommending in situ leaching. **[10]**

b. Propose a design to process the minerals using IER which could lead to value addition. **[10]**

QUESTION B3

a. Electrowinning and solvent extraction are normally applied in metal extraction. Explain the application of the two hydrometallurgical processes in the extraction of copper from its ores. **[15]**

b. Zinc cementation and carbon adsorption are methods of recovering gold from pregnant solution. Review their use in the extraction of gold. **[5]**

QUESTION B4

a) Explain the principle of gravity concentration. **[5]**

b) A plant is being fed with metallic ore assaying 4.0 g/t Pt equivalent minerals, producing a concentrate product assaying 150 g/t Pt equivalent minerals and tailings assaying 0.5g/t Pt

equivalent minerals. What is the recovery of Pt equivalent minerals? **[5]**

c. Draw the process flowsheet that you may develop and explain how you would select key process equipment for the design of a lithium processing plant for installation at a new mine 10km south east of Filabusi town. **[10]**

END OF EXAM QUESTIONS!!