UNIVERSITY OF MINES AND TECHNOLOGY, TARKWA
SECOND SEMESTER EXAMINATIONS, MAY

COURSE NO: MR 370
COURSE NAME: **COMPUTER APPLICATIONS IN MINERALS ENG.**
CLASS: **MR 111** TIME: 3 HOURS

Name**:** _____Index Number: _____

Answer all Questions

Question 1

An ore comprising of sphalerite (ZnS), lead Sulphide (PbS) and pyrite (FeS_2) was subjected to a flotation test. The concentrate and tailing obtained after the flotation test was screened using the screens; 75, 150, 300 and 600 µm. Masses retained on the individual screens were weighed and representative samples assayed for Zn, Pb, and Fe content (See Table 1). Programme a spreadsheet to;

i. Estimate the metal and mineral units (Gram Weight) in each size fraction for the concentrate and tails ***(16 marks)***

ii. Perform a combined % sphalerite (ZnS), lead sulphide (PbS) and pyrite (FeS_2) recovered and left in the tails at the end of the flotation test (Molar mass of Zn, Pb, Fe and S, respectively, are 65.38, 207.2, 55.85 and 32.07 g/mol) ***(5 marks)***

iii. Plot a bar chart for the combined minerals recoveries as function of the sieve ranges ***(4 marks)***

	Sieve range (µm)	Wight (g)	Assay (Zn%)	Assay (Pb%)	Assay (Fe%)
Concentrate	-600+300	21.9	58.1	1.08	0.65
	-300+150	25.2	55.1	1.59	0.98
	-150+75	27.1	45.2	1.41	1.35
	Sieve range (µm)	Wight (g)	Assay (Zn%)	Assay (Pb%)	Assay (Fe%)
Tails	-600+300	80.7	8.2	7.46	1.04
	-300+150	46.9	6.63	8.4	0.9
	-150+75	41.8	7.22	8.39	0.67

Question 2

The Department of Minerals Engineering has consulted you to help set up a copper processing plant. The processing plant would entail a Stockpile 1 of ore from three pits; Akonta, Hung and Cat 2, respectively. The stockpile 1 material is screened with a single deck screen and undersize product reserved as stockpile 2. The single deck screen oversize is sent to a cone crusher. Product from the cone crusher is sent to stockpile 2. Stockpile 2 material is transported to an AG mill (wet) with the help of a conveyor. Products from the AG mill is screened using a single deck screen 1 and undersize product sent to a sump. The oversize material goes to a Ball mill for further particle size reduction. The Ball mill discharge is subjected to screening using single deck screen 2 whose undersize then joins the products going to the sump. The single deck screen 2 is in a closed circuit with the Ball mill. The sump product

is pumped to a hydro-cyclone for classification to obtain the final cyclone products. With your knowledge in MODSIM, simulate the plant using the information provided. (Set icons to 7 and put a fly-out stream on the AG discharge and the cyclone products. The AG mill is run at 35 % solids)

System Data

Type of mineral to be processed	=	conventional minerals
Number of minerals	=	1
Specific gravity	=	6.5

Feed rate for all the pit are 90 t/h, 80 t/h and 95 t/h at 100, 98 and 96 percent solids, respectively, for pit 1, 2 and 3.

Unit model parameter

Double deck screen model is DSC2 but maintain all default values.
AG mill model type is MILL
Vibrating screen 1 model is CSCR but maintain all default values
Conveyor model is CONV but maintain all defaults values
Vibrating screen 1 model is CSCR but maintain all default values
Vibrating screen 2 model is KSCN but maintain all default values.
Pump model used is pump but maintain all default values
Cyclone model employed is CYCL but maintain all default values
Ball mill model is HFML, maintain all default values but make the power draw 1600.

Output data

Display solid flow rate (t/hr), % solid flow rate and water flow rate (l/min). Show the size distribution curves for the cyclone overflow and cyclone underflow and estimate the 80% passing screens.

(30 marks)

Question 3

A sample was taken from the Ball mill discharge of a plant and subjected to sieve analysis using screens, 150 µm, 106 µm, 75 µm, and 38 µm. A summary of the screen analysis and assay results is as shown in the Table below. Mineralogical studies of the ore sample suggested the presence of copper and some oxygen consuming minerals.

i. Estimate the d_{80} value for the ball mill discharge using the Rosin Rammler approach showing the size distribution curves ***(18 marks)***

ii. Perform a gold deportment analysis for the tailings samples and plot a bar chart graph of % gold distribution in each size fraction ***(15 marks)***

iii. If the plant was optimize to produce an average recovery of 98% at 80% passing 106 µm and lately the recovery has dropped to 87%, what are the possible cause for the drop in recovery and your recommendation. ***(12 marks)***

Screen sizes range (µm)	**WT. RETAINED (g) Ball mill product**	**Assay results (ppm)**
+150	*861.3*	*0.03*
-150+106	*413.7*	*0.05*
-106+75	*483.1*	*0.45*
-75+38	*343.6*	*0.13*
-38	*113.6*	*0.03*

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