PROGRAM	:	BACHELOR OF ENGINEERING TECHNOLOGY EXTRACTION METALLURGY
SUBJECT	:	**MINERAL PROCESSING 2B**
CODE	:	**MPRMTB2**
DATE	:	SUMMER SSA EXAMINATION
DURATION	:	3HRS
WEIGHT	:	40:60
FULL MARKS	:	100
TOTAL MARKS	:	100

EXAMINER	:	PROF W. NHETA
MODERATOR	:	DR E. MATINDE
NUMBER OF PAGES	:	3

INSTRUCTIONS TO STUDENTS:

ANSWER ALL QUESTIONS.
PUT YOUR FINAL ANSWERS ON THE ANSWER SHEETS PROVIDED.
INCLUDE YOUR WORKING IN THE SCRIPT. IF NO WORKING IS SHOWN IN THE SCRIPT, NO MARKS WILL BE AWARDED
ENSURE THE ANSWER SHEETS HAVE YOUR NAME AND STUDENT NUMBER ON THEM.
ENSURE YOU HAND IN THE ANSWER SHEETS WITH YOUR SCRIPT.
USE 4 DIGITS UNLESS THE QUESTION STATES OTHERWISE.

Question 1

100 t/hr of a Magnetite, Chromite and Quartzite ore is fed into a gravity concentrator. The gravity concentrate is subsequently subjected to a low intensity magnetic separator (LIMS). Magnetic and non-magnetic fractions are produced.

Characteristics of the feed are as follows:

Contains 5% Magnetite (Fe_3O_4), 4% Chromite ($FeCr_2O_4$) and the rest is Quartz.

Characteristics of the Gravity concentrate

90% of the iron fed into the gravity concentrator is recovered to the gravity concentrate

The Mass recovery to the gravity concentrate is 26.24%,

The grade of the gravity concentrate is 6.194% Cr.

LIMS Non-Magnetics

Contains 95% of the Chromite in the LIMS feed and 16.74t/hr Quartz,

LIMS Magnetics

4.444t/hr Magnetite is collected in the LIMS magnetics.

Calculate:

1.1 The SG of the gravity concentrate (6)

1.2 The % Fe in the Feed (3)

1.3 The overall % Recovery of Chromium to the Non-Magnetics fraction from the initial feed to the gravity concentrator (6)

1.4 What is the mass of the gravity concentrator tailings? (4)

1.5 What is the percentage Silica grade in the Magnetics (4)

1.6 The percentage of Iron recovered in the non-magnetics from the original feed to the gravity concentrator. (5)

1.7 The mass of chromite in the Gravity concentrate (2)

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Magnetite SG – 5.1	Chromite SG – 4.5	Quartz SG – 2.65
Fe – 56	O – 16	Cr - 52

Question 2

An ore contains Pyrolusite (MnO_2) SG – 4.79) and Silica (SiO_2) (SG – 2.65)
The feed grade to a two stage DMS plant is 25% Mn.
The feed rate is 200t/hr.
The bath density in the first stage is 2.85 and 75% of the Silica in the feed is rejected in the float product.
The sink product is then recrushed to -50mm and screened at 5mm.
The -5mm fraction mass is 10% of the first stage sinks mass and contains 10% Mn.
The -50+ 5mm is then retreated in a second stage DMS circuit and 85% of the contained Pyrolusite is recovered in the sinks at an SG of 4.53.

Determine:

2.1 The % SiO_2 in the feed (3)

2.2 The % SiO_2 in the first float fraction (5)

2.3 The grade of MnO_2 in the second stage feed (3)

2.4 The bath density in the final stage DMS (6)

2.5 The overall Mn recovery to the final sinks fraction from the initial feed (3)

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Mn – 54.9 O – 16

Question 3

3.1 While Electrostatic and High-Tension Separators have general similarities, they do have several differences. Discuss the seven differences. (14)

3.2 There are a number of limitations in operating these machines. Discuss six of these limitations. (6)

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Question 4

As a trainee metallurgist, you need to determine a grade-recovery curve of Cu based on the flotation results you obtained from your mark in the plant Laboratory shown in the Table below:

PRODUCT	CUMMULATIVE FLOTATION TIME (Sec)	MASS (g)	% Cu
Concentrate 1	30	14.3	27.12
Concentrate 2	60	10.2	22.38
Concentrate 3	120	18.3	15.26
Concentrate 4	300	32.6	5.45
Tailings		413.1	0.07
Assayed Head Sample and initial Weight		488.5	2.2557

4.1 Using this data, prepare a table that shows Mass %, assay units of Cu, % recovery of Cu, cumulative % recovery to concentrate and cumulative grade of concentrate. (25)

4.2 Plot a graph of the cumulative grade of the concentrate versus cumulative % recovery of Cu. (5)

[30]