QUALIFICATIONS: BACHELOR OF GEOMATICS and DIPLOMA IN GEOMATICS	
QUALIFICATIONS CODES: 07BGEO, 06DGEO	**QUALIFICATION LEVEL:** Level 7 - 07BGEO Level 6 - 06DGEO
COURSE NAME: Basic Surveying **COURSE CODE:** BSV521S	**COURSE LEVEL:** 5
DATE: June 2024	**PAPER:** THEORY
DURATION: 3 HOURS	**MARKS:** 100

FIRST OPPORTUNITY EXAMINATION QUESTION PAPER	
EXAMINER:	Mr F. J. Louw
MODERATOR:	Mr S. Sinvula

INSTRUCTIONS
1. You **MUST** answer **ALL QUESTIONS**
2. Write clearly and neatly.
3. Number the answers clearly.
4. Make sure your Student Number is on the EXAMINATION BOOK(s).
5. **MAKE SURE YOUR STUDENT NUMBER IS ON ALL THE DATA SHEETS AND THAT YOU SUBMIT THEM WITH YOUR EXAMINATION BOOK(S).**

PERMISSIBLE MATERIALS
1. Calculator, ruler, pen, pencil, and eraser.

THIS QUESTION PAPER CONSISTS OF 7 PAGES (Including this front page and 2 Data Sheets)

Question 1

1.1. Distinguish between the terms Error and Correction.   (2)

1.2. Briefly describe the term "Barometric Levelling".   (2)

1.3. List the TWO Principal Classifications of Surveying. What is the main difference between these Principal Classifications of Surveying?   (4)

1.4. How wide is one belt (degrees) in the Namibian coordinate system?   (1)

1.5. What do you understand by the term "Zero South Orientation" of a Theodolite or a Total Station?

                                                                                                 (2)

                                                                                                [11]

Question 2

2.1. Use the information below to calculate MEAN co-ordinates for point ST1.   (15)

Co-ordinates

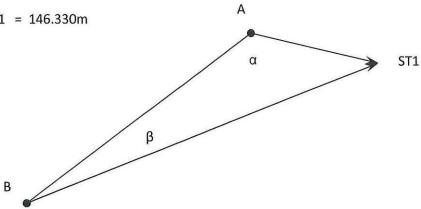| Name	Y	X
A	+ 51 786.365	+ 58 429.857
B	+ 52 987.953	+ 59 199.901

Angle α = 127° 43' 42"

Angle β = 4° 21' 49"

Final Reduced Horizontal Distances:

A to ST1 = 1521.120m

B to ST1 = 146.330m

2.2. Use the information below to calculate the co-ordinates for point D.   (9)

The final horizontal distance from A to D is 1 120.541m.

Co-ordinates

Name	Y ·	X
Δ Sun	-1 961.570	+14 268.710
Δ Moon	-6 520.650	+18 443.800
A	-2 756.460	+18 445.000

@ A	Final Observed Direction
Δ Sun	169° 13' 00"
Δ Moon	269° 58' 18"
D	100° 19' 30"

2.3. Use the data from the given the field book below to calculate final observed directions from at ST2 (No orientation correction needed). Show in table format.   (5)

@ST2   HI = 1.575m

Point/Station	Circle Left	Circle Right
Δ Draai	137° 16' 05"	317° 16' 02"
Δ Som	243° 23' 23"	63° 23' 19"
Δ Eis	0° 05' 58"	180° 06' 03"
Fence	129° 11' 11"	309° 10' 58"
RO	137° 16' 15"	317° 16' 12"

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Question 3

3.1. Calculate the final coordinates for the traverse points on Data Sheet 1. Use the said data sheet for all your calculations. Use the Bowditch Rule to adjust the traverse. Please note that the directions are oriented, and the distances are final horizontal distances. Please detach the data sheet and submit it with your examination book.   (10)

3.2. Calculate oriented directions for the traverse by completing the direction sheet on Data Sheet 2. Use the said data sheet for all your calculations. Please detach the data sheet and submit it with your examination book.   (10)

[20]

Question 4

4.1. Calculate the Y X Z co-ordinates for point ST3, by using the following information and the observations at ST3.   (20)

Please note:

The Atmospheric Correction, the Conversion to German Legal Metre, and the Combined Sea level & Scale Enlargement Scale Factor correction are already applied to all measured distances.

Combined Sea level & Scale Enlargement Factor = $1+ [(y^2/(2R^2)) – (H/R)]$, where R = 6 370km.

$\Delta H_{ab} = H_I – H_{sig} + S_{ab}/Tan(Z) + (1-k).S^2/(2R)$

Where R is earth radius (use R = 6 370 km), and k is an assumed relative ray curvature factor (use k = 0.13).

$H_a = H_b - \Delta H_{ab}$

Co-ordinates

Name	Y	X	Z (Height)	Description
Δ Tare	+101 871.540	+27 439.710	1685.150	Top of Pillar
110	+101 456.605	+32 040.196		Station

@ 101   Height of Instrument is 1,678m

Point	Fin. Observed Dir.	Slope Distance	Zenith Angle	Height Target
Δ Tare	163°31'26"		88°02'50"	0.000m
110	359°58'55"	376.252m	91°15'27"	2.055m

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Question 5

5.1.   Use the information and observations below to calculate the coordinates for the point **HILL**, by
       using the Q-point method of a resection calculation.   (20)

Co-ordinates

Name	Y	X
Δ SEOD	- 27 413.697	+ 43 835.878
Δ TSEN	- 26 682.152	+ 37 447.921
Δ MOTH	- 34 062.920	+ 39 734.000

@ Hill	Height of Instrument = 1.765m
Name	Final Observed Dir.
Δ SEOD	7° 00' 00"
Δ TSEN	124° 57' 00" **- Long Leg**
Δ MOTH	240° 07' 50"

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Student Number_____

Question 2.1.

Bowditch Adjustment Sheet

Note: All answers must be rounded off to 3 decimal places

DIRECTION & DISTANCE	JOINS	DIFFERENCES		STATION	FINAL	COORDINATES
		ΔY	ΔX		Y	X
				R	- 13 896.750	+ 11 812.180
299° 56' 00"						
644.760m						
				TR1		
27° 51' 19"	Do NOT Calculate Joins					
542.780m						
				TR2		
102° 47' 21						
825.270m						
				S	- 13 397.065	+ 12 431.053

Student Number_____   **Data Sheet 1**

Question 2.1.

Direction Sheet

1	2	3	4	5	6	7
Station	Final Observed Direction	Incoming/ Back Direction	Prov. Correction	Outgoing/ Forward Direction	Final Correction	Join Direction / Final Oriented Direction
@ RM 100						
Δ Trig A	315° 57' 20"					**315° 56' 54"**
Δ Trig B	129° 08' 47"					**129° 08' 21"**
S1	65° 47' 50"					
@S1						
RM 100	245° 47' 44"					
S2	58° 16' 31"					
@S2						
S1	238° 16' 29"					
RM101	56° 49' 25"					
@RM 101						
Δ Trig C	274° 01' 22"					**274° 01' 09"**
Δ Trig D	137° 03' 21"					**137° 03' 17"**
S2	236° 49' 27"					