NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY

FACULTY OF ENGINEERING AND THE BUILT ENVIRONMENT

DEPARTMENT OF LAND AND SPATIAL SCIENCES

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: July 2024	**PAPER:** THEORY
DURATION: 3 HOURS	**MARKS: 100**

SECOND OPPORTUNITY/SUPPLEMENTARY 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 3 Data Sheets)

Question 1

1.1. Briefly explain the **FOUR** important aspects of a resection.   (4)

1.2. To carry out a survey one needs to consider certain principle factors before executing the survey, describe **ALL** these principle factors.   (5)

1.3. Setting out is the process of using surveying equipment and techniques to transfer information from a plan to the ground. Describe the **THREE** distinct elements of setting out.   (3)

1.4. Describe **ANY THREE** qualities of a surveyor.   (3)

                                                                                          [15]

Question 2

2.1. Use the levelling observations given on the levelling field sheet below to determine the final heights using **ANY METHOD** (Data Sheet 1) which provides a full arithmetic check. All usual checks must be done, and any mis-closures need to be distributed. Note that the **BOLD** values are the Inverted Staff Readings.   (10)

Levelling field sheet

Point	B.S.	I.S.	F.S.	Final Heights
Bridge 1	-0.802			1217.355
A		1.231		
B		1.207		
Bridge 2	-0.920		-0.838	
C		0.899		
D	0.975		0.966	
E		0.817		
Bridge 3			-0.524	1217.016

2.2. Calculate the traverse on Data Sheet 2. 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.   (10)

2.3. Calculate oriented directions for the traverse by completing the direction sheet on Data Sheet 3. Use the said Data Sheet for all your calculations. (10)

[30]

Question 3

3.1. Use the information and observations below to calculate the co-ordinates for the point **RESEC**, by using the Q-point method of a resection calculation. (20)

Co-ordinates

Name	Y	X
Δ EIS	- 29 097.400	+ 171 069.100
Δ SOM	- 35 842.500	+ 153 064.100
Δ UIT	- 27 114.600	+ 154 255.400

Final Observed Directions.

@ RESEC	Height of Instrument = 1.650
Δ EIS	29° 16' 36"
Δ UIT	166° 26' 59"
Δ SOM	272° 34' 06" - Long Leg

3.2. Use the information and observations below to calculate co-ordinates for point **INTER**. (15)

Co-ordinates

Name	Y	X
Δ Win6	- 96 60.237	+ 62 379.183
Δ Win7	- 95 48.422	+ 63 421.960

@ Δ Win6	HI = 0.256m	
Oriented Direction to INTER		28° 13' 59"

@ Δ Win7	HI = 0.256m	
Final Horizontal Distance to INTER		528.000m

[35]

Question 4

4.1. Use the following Formula and the observations at **RP100**, to answer the questions that follow.

Please note:

The Prism Constant, 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.

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

Where R is the earth radius (use R = 6 365 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
Δ Eros	-10 489.688	+60 272.255	1 810.680 - Ground Level
RM14	- 5 297.730	+59 471.920	

@ RP100 Height of Instrument is 1,750m.

Name	Fin. Observed Direction	Slope Distance	Zenith Angle	Height of Target
Δ Eros	278° 28' 38"		87° 59' 24"	1.210m - Top of Pillar
RM14	212° 05' 02"	28.665m	94° 14' 28"	1.500m - Target

4.1.1   Calculate the Y X Z co-ordinates for point **Rassie**.   (16)

4.1.2   Calculate the height of RM14   (4)

[20]

Question 2.1.

Rise and Fall Levelling Sheet

NOTE: The **BOLD** and <u>Underlined</u> values are the Inverted Staff Readings. Rounded off to the nearest 3 (0.000) decimal places.							
Bridge 1	-0.802						1217.355
A		1.231					
B		1.207					
Bridge 2	-0.920		-0.838				
C		0.899					
D	0.975		0.966				
E		0.817					
Bridge 3			-0.524				1217.016

Height of Collimation Levelling Sheet

NOTE: The **BOLD** and <u>Underlined</u> values are the Inverted Staff Readings. Rounded off to the nearest 3 (0.000) decimal places.							
Bridge 1	-0.802						1217.355
A		1.231					
B		1.207					
Bridge 2	-0.920		-0.838				
C		0.899					
D	0.975		0.966				
E		0.817					
Bridge 3			-0.524				1217.016

Question 2.2.

Bowditch Rule - Adjustment Sheet

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

DIRECTION & DISTANCE	JOINS	DIFFERENCES		STATION	FINAL	COORDINATES
		ΔY	ΔX		Y	X
				Start	2 142.130	- 3 468.730
52.13.50						
693.210m						
				B		
351.05.30						
593.320m						
	Do NOT Calculate Joins			C		
267.15.50						
714.840m						
				D		
210.07.30						
461.780m						
				End	1 652.460	- 2 891.560

Student Number_____   Data Sheet 3

Question 2.3.

Direction Sheet

1	2	3	4	5	6	7
Station	Final Observed Direction	Incoming/ Back Direction	Prov. Correction	Outgoing/ Forward Direction	Join Diff. \ Final Correction	Join Direction / Final Oriented Direction
@START						
Δ Eros	215° 05' 58"					**215° 06' 02"**
Δ Win5	48° 29' 25"					**48° 29' 31"**
Δ Ludwig	327° 36' 10"					**327° 36' 18"**
ST1	21° 22' 04"					
@ST1						
START	201° 22' 00"					
ST2	344° 52' 22"					
@ST2						
ST1	164° 52' 30"					
ST3	17° 42' 59"					
@ST3						
ST2	197° 43' 10"					
STOP	346° 28' 01"					
@ STOP						
Δ Mun	116° 04' 30"					**116° 04' 24"**
ST3	166° 28' 10"					
Δ Ludwig	212° 12' 12"					**212° 11' 54"**
Δ Hohe	301° 59' 10"					**301° 59' 00"**