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 CODE: BSV521	**COURSE NAME:** Basic Surveying
DATE: July 2023	**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. Write short notes to explain the following terms:

1.1.1. Intersection. (3)

1.1.2. Systematic Errors. (2)

1.1.3. Engineering Surveys. (2)

1.1.4. Reverse Polar. (2)

1.2. How wide is one belt in the Namibian coordinate system, based on the central meridian? (2)

1.3. Why should intermediate sights onto important points be avoided during levelling? (2)

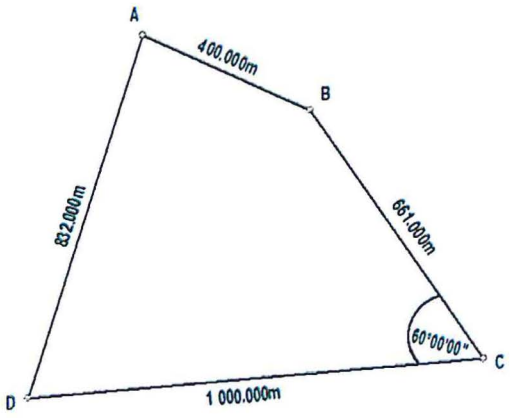
1.4. Name the THREE basic methods of determining a distance. (3)

1.5. Explain the term Reconnaissance in terms of a traverse. (4)

[20]

Question 2

2.1. Points A, B, C and D were placed around a dam for the survey of a proposed water right. As neither A to C, nor B to D was intervisible, the distances AB, BC, CD and DA, and the angles at A, B, C and D were measured. Unfortunately, it was discovered that only the recorded value of angle C was correct. From the information given in the sketch below, calculate the values of angles A, B and D. Please perform all possible checks. (10)



2.2. Use the levelling observations given in Data Sheet 1 to fill up the missing readings (Ж) and apply the usual checks on the final heights of all the points. All checks need to be shown and any misclosure needs to be distributed. Please detach the data sheet and submit it with your examination book. (10)

[20]

Question 3

3.1. Calculate the final coordinates for the traverse points 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 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 3. 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

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

Co-ordinates

Name	**Y**	**X**
Δ EROS	- 10 489.688	+ 60 272.255
Δ KLEINE	- 10 567.964	+ 70 190.852
Δ SWP	- 4 680.105	+ 62 348.557

@ TOP Height of Instrument = 1.615m

Name	Final Observed Dir.	
Δ KLEINE	331° 50' 04"	
Δ SWP	108° 33' 01"	**Long Leg**
Δ EROS	238° 35' 27"	

[20]

Question 5

5.1. Use the information and observations below to calculate the coordinates for point **WIT**. (10)

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.
- The directions are FINAL OBSERVED DIRECTIONS.

Co-ordinates

Name	**Y**	**X**
Δ AUB	- 26 635.590	+ 225 710.350
JOPIE	- 10 622.880	+ 225 193.620
@ WIT	**HI = 1.750m**	
Name	Final Observed Direction	Final Horizontal Distance
Δ AUB	267°10'39"	
JOPIE	208°40'45"	1 530.362m

5.2. Use the information below to calculate the coordinates for point **INTER**. (10)

Co-ordinates

Name	**Y**	**X**
ST1	+ 10 380.000	+ 35 438.700
ST2	+ 9 565.860	+ 36 102.

@ST1 HI = 1.585m

Oriented Direction to INTER 273°15'21"

@ST2 HI = 1.576m

Oriented Direction to INTER 261°41'54"

[20]

Student Number_____ **Data Sheet 1**

Question 2.2.

The first table is only given to show the missing readings, use the second table to answer the question.

Height of Collimation Levelling Sheet

POINT	BACK SIGHT	INTER. SIGHT	FORE SIGHT	COLL. HEIGHT	REDUCED LEVELS	CORRECTION	FINAL LEVELS
TSM100	Ж			1300.040	1296.475		1296.475
a	2.190		1.513	Ж	1298.527		
b		3.025			Ж		
c		2.079			Ж		
d	Ж		1.548	1302.184	Ж		
5		Ж			1304.043		
6		3.263			1298.921		
TSM101			Ж		1301.529		1301.565

Height of Collimation Levelling Sheet

POINT	BACK SIGHT	INTER. SIGHT	FORE SIGHT	COLL. HEIGHT	REDUCED LEVELS	CORRECTION	FINAL LEVELS
TSM100				1300.040	1296.475		1296.475
a	2.190		1.513		1298.527		
b		3.025					
c		2.079					
d			1.548	1302.184			
5					1304.043		
6		3.263			1298.921		
TSM101					1301.529		1301.565

Student Number_____ **Data Sheet 2**

Question 3.1.

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
				A	**+ 4 932.565**	**+ 67 891.023**
264° 10' 10"	Do NOT Calculate Joins					
381.265m						
				B		
270° 00' 05"						
295.892m						
				C		
291° 20' 33"						
356.826m						
				D		
5° 18' 38"						
391.227m						
				E	**+ 3 961.307**	**+ 68 371.758**

Student Number_____ **Data Sheet 3**

Question 3.2.

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
@ Resec1						
Δ Ounois	200° 13' 57"					**200° 13' 46"**
Δ Snake	2° 28' 16"					**2° 28' 01"**
Tr1	109° 49' 33"					
@Tr1						
Resec1	289° 49' 15"					
Tr2	107° 46' 58"					
@Tr2						
Tr1	287° 46' 43"					
RP1	127° 31' 23"					
@RP1						
Δ Triumph	55° 31' 12"					**55° 31' 20"**
Δ Sieg	152° 44' 55"					**152° 45' 05"**
Tr 1	307° 31' 30"					