NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY

FACULTY OF NATURAL RESOURCES AND SPATIAL SCIENCES

DEPARTMENT OF GEO-SPATIAL SCIENCES AND TECHNOLOGY

QUALIFICATIONS: DIPLOMA IN GEOMATICS BACHELOR OF GEOMATICS	
QUALIFICATIONS CODES: 06DGEM 07BGEM	**COURSE LEVEL:** Level 5
COURSE CODE: BSV521S	**COURSE NAME:** Basic Surveying
DATE: January 2019	**SESSION:**
DURATION: 3 HOURS	**MARKS: 100**

SECOND OPPORTUNITY/SUPPLEMENTARY EXAMINATION QUESTION PAPER	
EXAMINER:	**Mr. F. J. Louw**
MODERATOR:	**Mr. E. Sinvula**

THIS QUESTION PAPER CONSISTS OF 7 PAGES (Including this front page and 3 Data Sheets)

INSTRUCTIONS

1. You MUST answer ALL the 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, pencil and eraser.

Question 1

1.1. List **the TWO** principal classifications of surveying. Fully explain one. (3)

1.2. What do you understand by the term "Zero South Orientation"? (2)

1.3. How would you eliminate parallax in the telescope of a theodolite? (3)

1.4. Briefly explain how a surveyor would take a level reading under a bridge. What is this method called? (2)

1.5. 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. (6)

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

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Question 2

2.1. Briefly describe Barometric Levelling. (3)

2.2. Describe **ANY FOUR** uses of contour maps. (4)

2.3. Use the levelling observations given on Data Sheet 1 to determine the final heights using the "Height of Plane Collimation" method. All usual checks must be done, and any mis-closures need to be distributed. (13)

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Question 3

3.1. 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)

3.2. Use the following field observations at TOP, to calculate final observed directions. (5)

@ TOP Height of Instrument = 1.675m

Point/Station	Circle Left (CL)	Circle Right (CR)
Δ Finger	55° 40' 44"	235° 41' 13"
Δ Sandpoort	112° 36 '54"	292° 37' 04"
Δ Naub	246° 00' 12"	66° 00' 25"
Δ Groendraai	325° 02' 38"	145° 02' 50"
Δ Shadeck	10° 01' 14"	190° 01' 27"
RO	55° 40' 41"	235° 41' 05"

3.3. Use the information below to calculate the final horizontal distance between P41 and B1. (5)

Please note:

- The Atmospheric Correction and the Conversion to German Legal Metre are already applied to all measured distances.

Combined Sea level & Scale Enlargement Scale Factor = $1+ [(y^2)/(2R^2) - (H/R)]$

Where R is earth radius (use R = 6 370 km).

Co-ordinates

Name	Y	X	Z	Description
Δ KWB	- 2 802.630	+68 240.850	2 002.190	Standard Concrete Pillar
Δ SWP	-11 071.260	+64 410.770	2 068.600	Standard Concrete Pillar, on Reservoir (TOP).
P 41	- 9 889.760	+64 649.340	1 750.529	Top of Iron Peg

@ P41 Height of Instrument = 1.715m

Point/Station	Oriented Dir.	Slope Distance	Zenith Angle
Δ SWP	113° 49' 41"		90° 20' 09"
Δ KWB	63° 07' 33"		87° 57' 46"
B1	63° 31' 55"	109.648	93° 27' 53"

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Question 4

Use the information below to answer the questions that follows.

Co-ordinates

Name	Y	X	Description
Δ Blau	+ 37 054.410	+ 228 354.540	Standard Concrete Pillar
Kalk	+ 43 991.910	+ 219 483.720	Iron Standard
Morn	+ 43 786.880	+ 222 042.600	20mm Iron Peg

@ Kalk	Height of Instrument = 1.655m
Name	Final Observed Direction
Δ Blau	315° 58'15"
Morn	355° 25' 03"
MAST	70° 54' 34"

@ Morn	Height of Instrument = 1.685m
Name	Final Observed Direction
Δ Blau	313° 09' 15"
MAST	109° 43' 13"
Kalk	175° 25' 12"

4.1. Use the above observations and information to calculate orientated directions at Kalk and Morn. (9)

4.2. Calculate the MEAN co-ordinates of point MAST. (11)

[20]

Question 5

5.1. The following observations were done to determine the position on a hill. Three trigonometrical beacons were observed in order to fix its position. Calculate the co-ordinates of point **HILL** by using Collins Q-point method. (20)

Co-ordinates

Name	**Y**	**X**
Δ GAMIS	+ 38 301.950	+ 44 291.750
Δ ONIS	+ 65 302.360	+ 54 965.830
Δ SNAKE	+ 48 312.550	+ 37 289.940

@ HILL Height of Instrument = 1.719m

Name	Fin. Observed Dir.	
Δ SNAKE	168° 20' 25"	
Δ GAMIS	279° 40' 47"	
Δ ONIS	40° 14' 21"	Long Leg

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Student Number: _____ **Data Sheet 1**

Question 2.3

Height of Collimation Levelling Sheet

NOTE: The **BOLD** and Underlined values are the Inverted Staff Readings. Rounded off to the nearest 3 (0.000) decimal places.							
Point	B.S.	I.S.	F.S.	Collimation Heights	Reduced Heights	Correction	Final Heights
TSM1	1.455						1217.355
SP1		1.913					
ROOF1		**2.168**					
CP1	1.529		2.780				
SP2		1.215					
ROOF2		**2.085**					
CP2	1.057		2.710				
SP3		1.710					
SP4		1.573					
BM 100			1.005				1214.916

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
				T1	**- 13 397.065**	**+ 12 431.053**
282° 47' 21"	Do NOT Calculate Joins					
825.270m						
				T2		
207° 51' 19"						
542.780m						
				T3		
119° 56' 00"						
644.760m						
				T4	**- 13 896.750**	**+ 11 812.180**