ΠΑΜΙΒΙΑ UΠIVERSITY
OF SCIENCE AND TECHNOLOGY

FACULTY OF ENGINEERING AND THE BUILT ENVIRONMENT

DEPARTMENT OF LAND AND SPATIAL SCIENCES

QUALIFICATION: BACHELOR OF QUANTITY SURVEYING, BACHELOR OF GEOINFORMATION TECHNOLOGY, BACHELOR OF LAND ADMINISTRATION, BACHELOR OF ARCHITECTURE, BACHELOR OF TOWN AND REGIONAL PLANNING	
QUALIFICATION CODE: 07BQOS, 07BGEI, 07BLAM, 07BARC, 07BTAR	LEVEL: 5
COURSE: INTRODUCTION TO SURVEY AND MAPPING	COURSE CODE: ISM520S
SESSION: JANUARY 2024	PAPER: THEORY
DURATION: 3 HOURS	MARKS: 100

SECOND OPPORTUNITY / SUPPLEMENTARY EXAMINATION QUESTION PAPER

EXAMINERS:	Ms D. Husselmann and Mr D Varges
MODERATOR:	Mr S. Sinvula

THIS QUESTION PAPER CONSISTS OF 9 PAGES (Including this front page)

INSTRUCTIONS

1. Answer ALL the questions.
2. Write clearly and neatly.
3. Number the answers clearly.
4. Answers to calculations must be rounded off to three decimal places, excluding answers to co-ordinate conversions

PERMISSIBLE MATERIALS

1. Calculators and other drawing equipment

Question 1

1.1.   What do the following acronyms stand for?   (5)

      a.   MSL –

      b.   GIS –

      c.   GLm –

      d.   EDM –

      e.   RTK –

1.2.   State whether the following are True or False.   (5)

      a.   A theodolite and total station both measure distance and direction.

      b.   An automatic level does not need to be levelled at all as a compensator inside the level makes it exactly levelled.

      c.   For the Namibian LO co-ordinate system, it is convention to write the X before the Y.

      d.   The reading to the RO is only taken after the instrument is oriented.

      e.   Contour lines can be seen in reality.

                                                             [10]

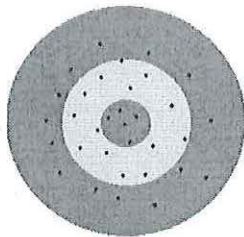---

Question 2

2.1.   List ANY TWO branches of surveys and explain what each one entails.   (4)

2.2.   Distinguish between an Observation and a Measurement.   (2)

2.3.   Explain the following neat sketches: (2)

a.
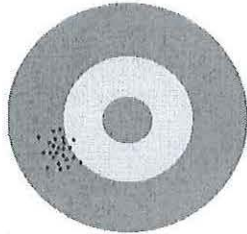
b.

2.4.   State the three basic principles that must always be applied during a levelling procedure.   (3)

2.5.   Briefly explain how a surveyor would take a level reading on the roof of a tunnel. What is this method called?   (2)

2.6.   Draw a sketch indicating the directions of increasing and decreasing for the co-ordinate values on the Namibian LO Co-ordinate System for both Y and X.   (4)

2.7.   What are the requirements of a Reference Object?   (3)

2.8.   List three different methods of determining distance   (3)

2.9.   What are the three common corrections applied to both tape and electronic distance (EDM) measurements?   (3)

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Question 3

3.1.   What is a traverse?   (2)

3.2.   Why is it necessary to run a traverse?   (1)

3.3.   Complete the sentence: (1)

In order to check accuracy (misclosure) one starts a traverse at a,

a. _____ , and ends at a, b. _____ .

3.4.   Differentiate between horizontal setting out and vertical setting out.   (2)

3.5.   What is the most accurate method for vertical setting out?   (1)

3.6.   Mention and differentiate the two Differential GPS surveying styles.   (4)

3.7.   Contour Interval is the vertical distance between any two consecutive contours. The contour interval is kept the same on a map to depict correct topography of the terrain. The contour intervals on a map depend on certain factors; name ANY THREE of these factors.

(3)

[14]

Question 4

4.1   The levelling field observations on Data Sheet 1 were carried out by a Surveyor. Reduce the data sheet using the "Height of Collimation" method to determine the final heights. All checks need to be shown and the correction needs to be distributed.

(10)

4.2   Use the mean observed directions below measured at TOP to answer the following questions. Complete in column formats using table 1 and table 2.

@ TOP   **Height of Instrument = 1.578**

Name   Mean Observed Directions

Δ MOON   211° 49' 30"

Δ SUN   121° 19' 26"

DD   192° 46' 54"

RO   211° 49' 21"

Join Direction TOP to Δ MOON   = 211° 49' 40"

Join Direction TOP to Δ SUN   = 121° 19' 34"

a.   Calculate final observe directions at TOP.   (3)

b.   Calculate the oriented direction from TOP to DD   (8)

4.3   Use information below and answer the questions that follow.

Co-ordinates

Name	Y	X
Δ LH (i)	+ 6 414.300	+ 6 308.480
Δ LR (v)	+ 4 790.540	+ 4 282.760
Δ CIVIC	+ 2 726.090	+ 4 833.150
Δ KBL	+ 687.270	+ 7 999.540
P3	+ 2 868.080	+ 5 650.030

@ P3   Height of Instrument = 1.675m

Name	Oriented Direction	Horizontal Distance
KLOOF	49° 50' 39"	3457.710 m

a.   Calculate a Join from P3 to Δ CIVIC.   (6)

b.   Calculate the co-ordinates for Kloof from P3.   (6)

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Question 5

5.1   Using the oriented directions and reduced distances below, calculate the traverse RM 1, ST1, ST2, ST3, RM 2. Complete Data Sheet 2 to answer this question. Adjustment must be done by the Bowditch Rule. Determine the linear misclosure and accuracy of the traverse.   (17)

From	To	Oriented Dir.	Reduced Dist.
RM 1	ST1	185° 18' 40"	391.230m
ST1	ST2	111° 20' 30"	356.820m
ST2	ST3	90° 00' 00"	295.890m
ST3	RM 2	84° 10' 10"	381.260m

Co-ordinates

Point	Y	X
RM1	+3 961.300	+8 371.820
RM2	+4 932.560	+7 891.020

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*Student Number*_____   *Data Sheet 1*

Question 4.1

Height of Collimation Levelling Sheet

NOTE: The **BOLD** and <u>Underlined</u> values are the Inverted Staff Readings.							
Answers should be to 3 (0.000) decimal places.							
Point	B.S.	I.S.	F.S.	Collimation Heights	Reduced Heights	Correction	Final Heights
A	3.565						1296.470
B	2.192		1.510				
C		3.077					
D		**-2.538**					
E	1.515		2.523				
F		0.735					
G		1.860					
H			0.672				1299.070

*Student Number*_____   *Data Sheet 2*

Question 3.2

Table 1: Final Observed Directions

@ TOP			
	Mean Observe Direction	RO Correction	Fin. Observed Direction
Δ MOON	211° 49' 30"		
Δ SUN	121° 19' 26"		
DD	192° 46' 54"		
R/O	211° 49' 21"		

Table 2: Oriented Direction

@ TOP				
Name	Fin. Observed Direction	Join Direction	Difference / Correction	Oriented Direction
Δ MOON				
Δ SUN				
DD				

Question 5.1

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
				RM 1	+3 961.300	+8 371.820
185° 18' 40"						
391.230m						
				ST1		
111° 20' 30"						
356.820m						
	Do NOT Calculate Joins			ST2		
90° 00' 00"						
295.890m						
				ST3		
84° 10' 10"						
381.260m						
				RM 2	+4 932.560	+7 891.020